AGRICULTURAL CHEMICALS

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Agricultural Chemicals Division

PENNSYLVANIA SALT MANUFACTURING COMPANY

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EXTRA **Powco News** EXTRA

★★★ ONE PARK AVENUE, NEW YORK 16 JULY, 1947

FLY 25 TONS OF BHC TO STEM LOCUST PLAGUE

Pilot and co-pilot check cargo moorings before taking off on their emergency flight to El Salvador. Precious cargo of BHC is shipped via U. S. Airlines to Miami and from there to El Salvador.

John Powell & Co. Makes First Shipment of Kind to Meet El Salvador Emergency

NEW YORK CITY, June 4, 1947—Twin-engined DC-3's of the U. S. Airlines took off from Bendix Field here today with 50,000 pounds of the new wonder insecticide, Benzene Hexachloride, made by John Powell & Co., Inc., in response to an emergency request from the government of El Salvador to stem a locust plague that threatens to wipe out the country's coffee crop.

The Powell Company, one of the largest insecticide manufacturers in the U. S., first learned of the El Salvador locust plague a few days ago. Officials of the Central American government, frantic to find a means to prevent complete annihilation of their country's main crop consulted Powell entomologists with their problem.

With the locust plague so critical that it was impossible to wait for ordinary means of transportation, the DC-3's were chartered to leave as soon as the deadly insecticide could be processed at the Powell plant and delivered to the airfield. The air shipment — first of its kind ever made — went non-stop to Miami, Fla., and from there by TACA Aircraft to El Salvador.

Benzene Hexachloride is one of the newer and more revolutionary organic chemicals in use in the constant war against insect pests. BHC, as it is known commercially, promises to be as important as DDT in the insecticide field. Rather than being a competitor of DDT, it is a valuable adjunct in the war against insects because it controls pest not affected by DDT.

BHC kills insects by fumigation, by contact and by action as a stomach poison. During World War II it won prominence in the insecticide field by controlling the Turnip Flea Bettle which threatened one of Great Britain's main food crops.

In this country, BHC currently is being used with great success agriculturally in controlling cotton insects, grasshoppers, plant lice and soil-infesting insects such as wireworms.

Powell Plant Works Night and Day

Working day and night to supply this emergency insecticide order, the plant of John Powell & Co., Inc., manufacturers of basic insecticides, kept a steady stream of trucks shuttling between Brooklyn and the Bendix Airfield, near the George Washington Bridge, until the last DC-3 had taken off with its three-ton load of grasshopper death juice.

Quick laboratory tests together with pertinent information from the Powell files revealed that the sensational new organic chemical, Benzene Hexachloride, would do the job in short order.

Simultaneously, the H. D. Hudson Manufacturing Co. of Chicago rushed special equipment to the El Salvador government so that the deadly insecticide could be applied immediately by airplane spraying methods.

Hundred fifty pound drums of BHC 50—the ideal form of benzene hexachloride for locust control—are loaded from trucks onto DC-3's at Bendix Airfield.

Baker offers you "custom-made" 2,4-D formulations to help solve them!

If you are selling in Oklahoma, your weed problem may be sagebrush. In Texas, it may be mesquite. In the Dakotas . . . wild mustard.

Every region of the country, even every county or farm, has its particular weed problem. What are the problems where you sell?

There is no one 2,4-D weed killer that is applicable for all situations. In fact, every problem calls for a custom-built product.

That is why Baker—a name known for quality chemicals for nearly 50 years—manufactures not one or two, but a number of 2,4-D formulations.

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What kind of spraying equipment will be used? Will spraying be done by airplane? Is the water supply plentiful, or are you located in an arid region? Do your customers prefer a powder, or liquid concentrate, that would yield either a clear solution or a creamy emulsion?

Baker makes 2,4-D formulations for large scale or small operations . . . for pastures or growing grains . . . for "hard-to-kill" weeds and woody growth . . . for application by airplane, fog-sprayers or other special machinery . . . for almost any condition or situation.

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FREE BULLETIN for your weed problems!

Get this valuable free bulletin on Baker's 2,4-D formulations. It tells where, when and why to use each. We will also include a reprint of an article on 2,4-D by a USDA expert, and report of the North Central Weed Control Conference. Send today! Write to *Agricultural Chemical Division,* J. T. Baker Chemical Co., 66 S. Main St., Phillipsburg, N. J.

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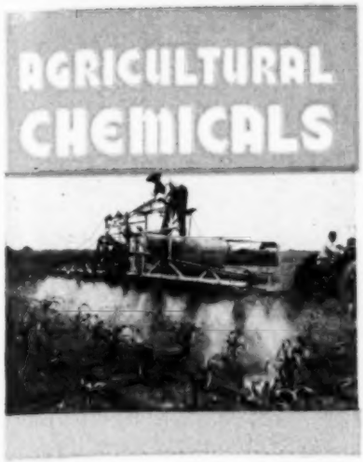
under Baker label, or your own!

Many sales organizations that market weed killers are turning to Baker's "know-how" for up-to-the-minute 2,4-D formulations. If you are interested in distributing weed killers "custom-made" for your local weed problems, write and tell us your requirements. We are in a position to supply you these products under the Baker label—or your own private brand name. Get the details today! Address the *Agricultural Chemical Division,* J. T. Baker Chemical Co., 66 South Main Street, Phillipsburg, N. J.

Baker's Agricultural Chemicals



A Monthly Magazine For the Trade

THIS MONTH'S COVER

Control of corn borer is a major project in most of northeastern United States. Spraying appears to be most efficient and economical, though it involves a considerable outlay for equipment. This machine covers 10 rows of corn at a time, and the owner treats from 200-250 acres per day. (See article on corn borer control, this issue).

JULY, 1947
VOL. II No. 7

In This Issue:

AGRICULTURAL CHEMICALS

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With 2,4-D for instance, Du Pont scientists learned early in their work that the "true salt" form of this chemical offers the farmer greater convenience for practical weed control.

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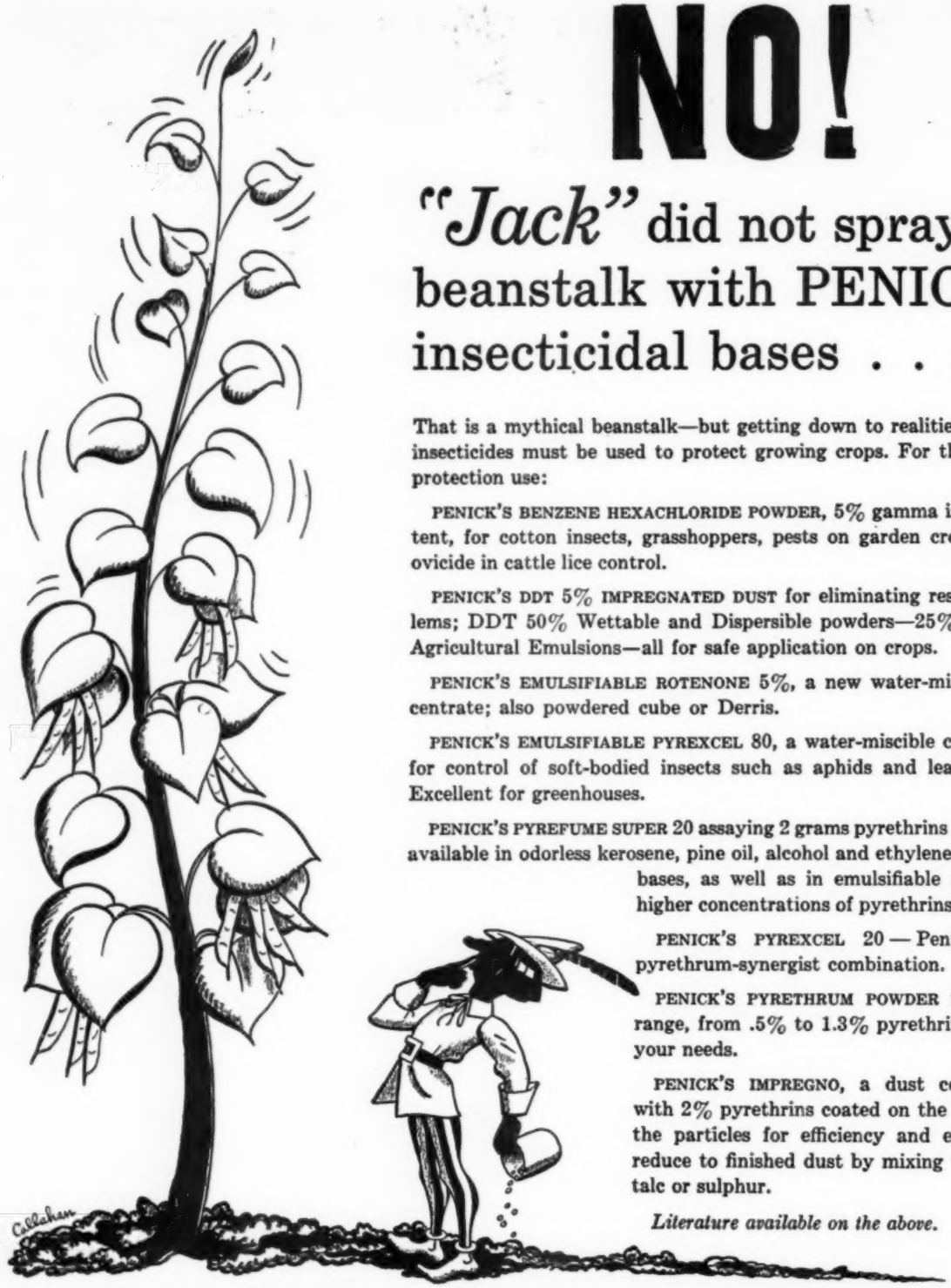

NO!

"Jack" did not spray his beanstalk with PENICK'S insecticidal bases . . . . .

That is a mythical beanstalk—but getting down to realities, effective insecticides must be used to protect growing crops. For that greater protection use:

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PENICK'S PYREFUME SUPER 20 assaying 2 grams pyrethrins per 100 cc. available in odorless kerosene, pine oil, alcohol and ethylene dichloride bases, as well as in emulsifiable form; also higher concentrations of pyrethrins if desired.

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PENICK'S IMPREGNO, a dust concentrate with 2% pyrethrins coated on the outside of the particles for efficiency and economy—reduce to finished dust by mixing with clay, talc or sulphur.

Literature available on the above.

S. B. PENICK & COMPANY

THE EDITOR COMMENTS

THE Andresen Bill, that is the new Insecticide and Fungicide Bill, H.R. 1237, became law on June 25. With the signing of this new act by the President, industry, agriculture, and government officials must have heaved a sigh of relief. The new act is quite definitely a law grown out of numerous conflicting views. After four years of writing and re-writing, it is, we feel, a very satisfactory compromise. With a continuation of sensible enforcement which has marked that of the Insecticide Act of 1910, it should be of great value to agriculture and to the reputable manufacturer. That it also marks a long stride toward country-wide uniformity in state legislation is quite obvious to those who have struggled toward this end for a number of years past.

L. S. Hitchner, executive secretary of the Agricultural Insecticide & Fungicide Association, in stating that the industry is well satisfied, commented: "The new law represents the best possible combination of all viewpoints toward the common goal of protecting the farmer and general public, protecting the conscientious manufacturer, and making possible efficient and economical distribution. It is particularly gratifying that this new Federal law will serve as a pattern for more states to adopt the uniform state insecticide act, developed by the Council of State Governments to coordinate state activities with the Federal Law. Nine states have already done so in anticipation of the Federal enactment."

Hearings on the proposed regulations to enforce the new insecticide law will probably be held in the near future by the USDA. Agriculture and industry will be given an opportunity to collaborate again with the Department. Effective, workable regulations should follow. Those provisions of the act affecting rodenticides and herbicides will become effective next December 25, and those covering insecticides, fungicides and allied chemicals next June 25. On devices, the law became effective when signed by the President.

Between now and the effective dates, every manufacturer who ships in interstate commerce should familiarize himself with the law and the regulations when issued. We of AGRICULTURAL CHEMICALS will do our part to aid in clarifying any cloudy point as they arise and in keeping the industry posted.

CHEMICAL fertilizers are the bunk. True science recognizes that within the unweathered rock crystals of the soil is ample nutriment for crops. American agriculture approaches its soil management problems through economics, not science. Instead of adding useless nitrogen, phosphate, potash, et al, to the soil, we herewith and hereafter suggest that all growers and orchardists use a thin or thick layer of "unweathered rock crystals" on their fields, according to choice, and wait thirty years for it to weather into suitable fertilizer. In the meantime, we also suggest that America and the hungry of Europe subsist on a diet of sawdust. We must not let the economics of food production swerve us from a course of true science. For remember that within the heart of every unweathered rock crystal there lies ample nutriment for our crops.

Fold up your tent and steal away in the night, Mr. Fertilizer Manufacturer, for Faulkner, author of "Plowman's Folly," is out with another one. This time, he calls it "A Second Look." Although he aims this latest at commercial fertilizers and modern soil management, we have a hunch that really he is out to placate some of the critics of his previous effort. But we doubt his success. Because if Faulkner is correct and this recent rehash of old ideas justified, then our experiment stations, departments of agriculture, and universities have been peopled with complete dopes these many years. And practical agricultural science has been far off the track. But until the Faulkner ideas attain full fruition in feeding the world, we do not suggest burning down our fertilizer factories.

Guest Editorial written especially for this issue of Agricultural Chemicals.

Fertilizers and Soil Improvement

By W. A. Minor
Assistant to the United States Secretary of Agriculture

THE people of this nation, urban as well as rural, are concerned about how the nation's soil is being managed. They realize as never before that our ability to maintain a high standard of living depends upon the nation's soil resources. They want our soils improved and managed as a permanent asset which cannot be replaced.

American agricultural production played an outstanding part in the winning of World War II. It is now playing an equally noteworthy role in helping to feed and clothe the war-ravaged peoples of the world. It is significant that in the period since the beginning of World War II while our agricultural production has increased 25 to 30 percent, our fertilizer consumption has about doubled. Fertilizer usage had a large part in providing this critical increase in agricultural production at a time when such production has been most needed.

The plant food reserves in some of our nation's soils have been depleted by unwise use, erosion, and the record agricultural production of recent years. We need to restore, maintain and improve the productive quality of the soil which is the base of our agricultural production.

What place do fertilizers have in a national program of soil management and improvement? A brief consideration of the results of certain studies will indicate at least one answer.

Soils of the East and South are naturally of low fertility. But under proper management, which includes the use of fertilizers, lime and organic matter, they have become some of the most productive in the nation. The production of 500 bushels per acre of potatoes in Maine, 10 tons of tomatoes in New Jersey, 75 bushels of corn or a bale of cotton per acre in the Carolinas, and 500 crates of citrus fruit in Florida are not unusual. What has happened to the soils?

A very careful study of soils from nearly 100 citrus groves in Florida showed they con-

(*Turn to Page 67*)

A Classification of

HERBICIDES

By Keith C. Barrons
Agronomist, Dow Chemical Company
Midland, Michigan

THE development of 2,4-D and other new herbicides has pushed chemical weed control into a foremost position of agricultural progress. Experiment station and extension workers as well as those who merchandise agricultural chemicals are daily beset with questions regarding weed killers and their uses. It is important, therefore, that everyone working in this field should realize that there are many kinds of herbicides for many specific uses. The correct one must be used in the right way under the proper conditions. A fair knowledge of the places filled by different herbicides in the overall weed control picture is indispensible if one is to be of utmost service to farmers and others who almost daily encounter many problems of vegetation control.

In 1942, Robbins, Krafts and Raynor* very ably classified the herbicides used commercially up to that time. New materials have come into wide use since then and a revised classification is advisable. Such a classification, based largely on the manner in which the herbicide works on the plant, is presented in this article with the hope that it will help to clarify the entire weed control situation.

Herbicides are usually applied to plant foliage as sprays and dusts. Chemicals, both liquid and dry, used straight or diluted, may be applied. Much is yet to be learned as to how many herbicides kill; however, enough is understood of plant responses to permit classification. In some instances, a given chemical will fall in more than one group depending on the amount used, method of application and crop and weed species in the treated area. Modifications of the following classification will no doubt be required as new developments in herbicides take place.

Group 1; Selective Herbicides

WHEN applied under proper conditions and at suitable concentrations, selective weed killers leave others relatively unharmed. These weed killers are useful where a resistant crop plant is being produced and susceptible weed species are found in the field. Four types of selective weed killers are recognized based on the type of selective action involved.

A. *Selectivity based on minimum wetting of the crop and limited absorption of the toxicant because of leaf wax protection.*

If foliage is treated when still quite small, small grains such as flax, peas, alfalfa and certain other crops are difficult to wet by aqueous sprays of chemicals in this group because of their leaf shape and a relatively thick and continuous leaf wax or cutin. That part of the toxicant which does adhere to the plant is not readily absorbed. Sulfuric acid has been used for spraying such crops in Europe and to a limited extent in the United

* WEED CONTROL, Robbins, Krafts and Raynor, McGraw-Hill Co., New York, 1942.

States. In recent years, salts of certain phenolic derivatives have been widely used for the control of mustard and other annual weeds, particularly in western United States and Canada on small grains and flax. Various other compounds used as selective herbicides, also depend on the cutin of the crop plant for their selective action.

B. Selectivity based on the physiological resistance of carrots and related plants to certain petroleum fractions.

Since about 1942, stove oil, Stoddard Solvent and other petroleum fractions have been used for selective spraying of carrots. Parsnips, parsley, celery, and other members of the same family have been treated successfully at certain stages of development without damage to the crop. Just why most small weeds are killed by this treatment while the crops mentioned go unharmed, is not understood. It is evident that the crop plants are thoroughly wet with the oil, so some physiological differences must exist.

C. Selectivity based on differential plasmolysis when sprayed with salt solutions.

Still in the experimental stage is the use of saturated or near-saturated solutions of various salts as selective sprays on beets. Apparently the cells of most weeds are killed by plasmolysis, which is a withdrawal of cell sap by the action of concentrated solutions of soluble salts. Just why garden beets, sugar beets, and certain of their relatives resist this action is not clearly understood.

D. Selectivity based on the physiological resistance of many members of the grass family and certain other crop plants to the herbicidal action of growth regulating substances such as 2,4-D.

These materials so upset the growth of many plants that death occurs. For some reason not well understood, most grasses, a few other crop plants, and certain non-grass weeds do not respond in the same manner. By proper regulation of dosage and time of application, many weeds may be killed without injuring the crop. 2-4-D is the most widely used of all selective weed killers, being used on lawns and many non-agricultural areas in addition to certain farm crops and pastures.

In addition to its application as a foliage spray or dust, 2,4-D has been used experimentally as a selective soil treatment. Roots of grasses are much more sensitive to growth substances than are their tops; however, roots of certain weeds appear to be sufficiently more sensitive than those of some grasses to permit this method of application.

Group 2; Translocated Herbicides

ALTHOUGH earlier classified as selective herbicide, 2,4-D also falls within this group because the chemical or its effect is readily translocated. Application to the above-ground portion of plants results in unfavorable growth response in roots and underground stems.

Certain arsenical compounds in acidified solution are transmitted into roots of some kinds of weeds and have been used for the eradication of perennials in western United States. Their use has largely been supplanted by 2,4-D and other new herbicides. Ammonium sulfamate is a potent herbicide that is actively translocated into the roots of many plants. It is recommended by its manufactures for the control of poison ivy and certain other plants.

Group 3; Contact Herbicides

MANY different chemicals have been used from time to time to kill all top growth on contact. These materials are not actively carried into the roots. Small annuals die from one treatment, but perennials are killed only by repeated application. Sodium chlorate and the arsenical herbicides, generally regarded as soil sterilants, also kill top growth on contact and have been used in dilute solution for such purposes. Petroleum oils have been widely used as contact herbicides. Recently certain phenolic compounds applied in oil emulsions have come into use. They have much the same action as oil and in many instances are less expensive. Potato vine killers are contact herbicides, often of a type containing a phenol derivative. Calcium cyanamide applied to small weeds such as found growing in asparagus acts as a contact herbicide if ample dew is on the plant.

The contact herbicides are sometimes used to eradicate winter

Carrots on left of photo were sprayed with Stoddard Solvent one week before picture was taken.

annual weeds from established perennial crops such as alfalfa. The spray is applied right after cutting during the season when the alfalfa is relatively dormant. Although the tops of the alfalfa are "burned" no permanent damage is done and the small weeds are killed. In one sense this is a selective spraying technique yet all exposed foliage is burned. The contact type of herbicide is used rather than a selective because the maximum kill of small weeds is realized.

Group 4; Temporary Soil Sterilants

THESE materials kill largely through absorption by the roots. However, their toxic effect is relatively temporary, often disappearing in a few weeks depending on the amount applied and on soil and climatic factors. Sodium chlorate has sometimes been classified as a temporary soil sterilant. When used in relatively light dosages on highly susceptible species it may be sufficiently leached to permit normal growth of many crops within one year. However, herbicidal dosages usually have an effect over a longer period of time. The chemicals in the temporary soil sterilant group may be divided into three classes as follows:

A. *The Volatile Chemicals.*

Several materials that may be applied as liquids but which volatilize in the soil, have proved useful for specific weed situations. Chloropicrin used as a fumigant for soil-borne insects and diseases is a fairly efficient killer of weed roots and weed seeds. Carbonbisulfide has been widely used as a temporary soil sterilant for the control of certain perennial weeds. Certain chlorinated hydrocarbons have been found promising for killing patches of quackgrass and other perennials not susceptible to sprays of 2,4-D.

B. *Chemicals that quickly decompose in the soil.*

A number of materials of this type have been tried from time to time. The one of greatest importance at present is calcium cyanamide. This powdered or granular material is toxic to plant growth but undergoes a change in moist soil whereby its toxicity is lost and it becomes a valuable nitrogenous fertilizer. Calcium cyanamide has been used for killing weeds and weed seeds in tobacco plant beds before planting and also for killing small annual weeds in asparagus beds during the cutting season. In this instance, the roots of the asparagus are so deep that they are not injured when the herbicide is applied to the surface. Before leaching to the zone of asparagus root growth, the toxic properties of calcium cyanamide are lost. As mentioned under group 3, this material also kills on leaf contact if plants are moist with dew or rain when applied.

C. *2,4-D and other growth regulating substances as temporary soil sterilants.*

These materials have already been classified as selective and as translocated herbicides; however, when applied to the soil in larger quantities they are temporary soil sterilants with respect to many growing weeds and weed seeds. The use of growth regulating substances for soil treatment is still in the experimental stage.

Group 5; "Permanent" Soil Sterilants

THIS group includes sodium chlorate, arsenicals, and compounds of boron all of which render the soil toxic to plant growth when applied in sufficient quantities. The length of time the soil remains toxic depends on the nature of the soil, the amount applied, and extent of rainfall. When applied as sprays while plants are actively growing, they kill top growth by contact, but their effect on the root system is chiefly by absorption from the soil. These herbicides have been used on a wide scale in recent years, particularly in the western U. S. for the eradication of unwanted perennial weeds such as field bindweed. More recently, herbicides such as 2,4-D that do not have a long-time toxic effect on the soil have come into use for weed eradication, particularly on crop land. 2,4-D has largely replaced the soil sterilants for the control of many perennials.

The "permanent" soil sterilants are still widely used where no vegetation is wanted, for example, on railroad beds, driveways, parking lots and certain recreational areas.

(*Turn to Page 67*)

Same carrots (as seen on page 18) several weeks later. Note how clean and free of weeds the rows are. No hand weeding was done. (Photos by Massachusetts State College).

What CHEMICALS for Corn Borer Control?

by

Dr. George C. Decker

Entomologist, Illinois Natural History Survey, and Illinois Agricultural Experiment Station, Urbana, Illinois.

WITHIN the past 5 years the European corn borer has moved westward from the Great Lakes area to and in some places beyond the Missouri River. The borer invasion into the very heart of the corn belt has stimulated increased interest in the development of new and improved control methods. Whereas in the past insecticides played a minor role in corn borer control, it now seems quite possible that they may be used extensively to protect market garden corn, canning corn, hybrid seed corn, and perhaps even considerable acreages of hybrid corn grown for feed. With all of the northeastern one-fourth of the United States infested and approximately three-fourths of the nation's corn acreage involved, any concerted move in this direction would create a greatly expanded market for suitable insecticides.

The idea of using insecticides to control the European corn borer is certainly not new. Tests involving the use of lead arsenate, calcium arsenate, and cryolite were initiated more than 25 years ago. During the intervening years, a group of state and federal entomologists, led by C. H. Batchelder of the Bureau of Entomology and Plant Quarantine, patiently pursued their research in this field. They succeeded in developing and perfecting equipment, formulations, and treatment schedules which the market garden corn growers of the Atlantic Seaboard and the Great Lakes Station could use profitably for the protection of their crops. At first, sprays and dusts containing nicotine or rotenone offered the greatest promise of success. Ryania, a South American plant product which came into the picture in 1943, has won much acclaim and appears to be one of the most effective insecticides yet used again the corn borer. In the last two years, however, all previously used materials seem to have given ground in favor of DDT (dichlorodiphenyl-trichloroethane), but the material that may eventually be used has not yet been determined.

Prior to the summer of 1945, entomologists, agronomists, and growers were all of the opinion that the use of insecticides would be practical only on the valuable plantings of early market garden sweet corn. Apparently, little or no attempt was made to determine the possible value of using insecticides on other types of corn. This left the average grower, the hybrid seed producer, and the canner in the position of having to depend entirely upon cultural practices including the observance of proper planting dates. Large midwestern canners complained bitterly when they found it necessary to choose between wrestling with badly infested corn or limiting their packing season to a three- or four-week period during which time comparatively clean corn can be produced between

Left: Airplane spraying with an oil-DDT concentrate spray applied at the rate of two gallons per acre has been very effective and appears to be practical in control of corn borer.

the first and second generations of borers. Hybrid seed corn producers were likewise disappointed to find that, when they refrained from planting their corn early, unfavorable weather conditions frequently delayed planting to such an extent that the corn failed to mature and dry properly before frost.

The dilemma of these two groups of producers prompted the Illinois State Natural History Survey to initiate in 1945 a research program involving the use of insecticides on canning corn, hybrid seed corn, and field corn. Insofar as results may be measured in terms of borer reduction, the results of these preliminary experiments were not astounding but they compared favorably with the results obtained when the same insecticides were applied to market garden corn. The hybrid seed producer observed that treatment reduced damage so that he obtained a larger yield of a higher quality product and the canner found that, although many ears were infested, the infestation was reduced to a point where the crop could be efficiently handled in the processing plant. All parties concerned were definitely encouraged by the results obtained and insisted upon the development of a greatly expanded research program for 1946.

Strange as it may seem to some, the corn borer is very susceptible to the action of many insecticides and is easily killed by them if proper contact can be made. In airplane dusting experiments, where the dust tends to drift badly, a substantial reduction in the borer population may be observed in corn at least 20 to 30 yards beyond the margin of the treated plot. There seems to be little doubt that corn borers are much more easily controlled on the leaves and in the main stalks of the plant than they are in the ears. Several workers have observed repeatedly the almost complete elimination of borers in the main stalks of plants which showed 40 to 50 percent ear infestation.

In any discussion of corn borer control, it must be understood at the outset that the practicality of applying a control measure will be largely determined by the intensity of the infestation. In many fields borer populations do not develop to a point where the application of insecticides would be justified. As a rule, potential or probable infestations cannot be predicted nor estimated very far in advance. Hence, a grower frequently will have to make a dual decision: (1) Should he treat his crop; and (2) when should the treatment or treatments be applied. To make these decisions with any degree of accuracy he should know and take into account: (1) the overall corn borer population in the community; (2) the height and stage of development of his corn; (3) the number of egg masses per plant; and (4) the probable rate of egg deposition for the next two weeks (this requires a knowledge of percent moth emergence and abundance).

In any treatment schedule involving three, four, or more applications of insecticide, one properly-timed application will probably account for more than 50% of the control accomplished and each additional application will contribute to the total control obtained by an ever-decreasing amount. Therefore, whereas the market gardener who must approach perfection in his operations may be justified in applying four or five treatments, other growers who cannot afford an elaborate program of this type may be fully justified in adopting a one-, two-, or three-treatment schedule which might conceivably and often does afford adequate protection without necessarily approaching perfection.

A summarization of the data developed from the various preliminary experiments of 1945 and previous years led to one more or less philosophical conclusion, namely, that while we are dealing with one insect, the European corn borer on market garden corn, hybrid seed corn, and canning corn presents three entirely distinct problems involving different ecological conditions, methods of approach, and objectives.

Market Gardener's Problem

THE market gardener is primarily interested in getting his corn on the opening or premium market. He plants early-maturing varieties at the earliest possible date and usually fertilizes heavily. This early corn receives very heavy oviposition, and since well-advanced corn favors a comparatively high rate of borer survival, almost unbelievable infestations may develop. The housewife who will eventually purchase this corn will object strenuously if any considerable number of borers is found in the ears and since field inspection and sorting operations are expensive and the opening of tips spoils the appearance and affects the marketability of corn, the grower is primarily interested in producing 100% borer-free ears.

During the period of moth flight, eggs are being deposited and are hatching continuously. None of the insecticides in use have ovicidal properties and it is therefore essential that the plants be protected at all times by a continuous and uniform film of a suitable insecticide. The plants are growing constantly and repeated applications of the insecticide are needed to maintain such coverage. Furthermore, since corn borer eggs normally hatch in from 4 to 6 days, the repeated applications must be made at approximately 5-day intervals. In any area where overwintering corn borers are at least moderately abundant, early market garden corn is certain to attract heavy oviposition and the grower knows that, to obtain the protection he desires, he must make the first application of spray or dust when the first eggs begin to hatch. This means that if a 5-day schedule is to be followed, he will have to make at least four or five applications of the insecticide to maintain complete coverage throughout the extended period of egg hatching.

Sprays and dusts containing suitable amounts of rotenone, "Ryania," or DDT have been found to be very effective in controlling the borer on market garden corn. However, the relative merits of these materials seem to vary in different sections of the country and, since the entomologists in practically all states have either made or are prepared to make suitable recommendations for the guidance of their growers, a further discussion of specific state or regional recommendations would be superfluous and ill-advised.

The Canner's Problem

THE canner, though essentially a sweet corn producer, faces an entirely different problem and views it in a different light. While the canner would like to have perfectly clean corn, he does not object to a few infested ears. Since all of the corn is to be husked upon entering the plant and the canner is prepared to inspect and trim individual ears, the problem of field inspection and sorting does not bother him. There is, however, a limit to the degree of infestation that can be efficiently and economically handled on the sorting belts of any processing plant. The canner is therefore primarily interested in obtaining the largest possible yield of a high quality product and in holding the infestation to a level which will permit the proper processing of the corn.

When a community becomes heavily infested with corn borer, the canner who wishes to avoid canning borers with his corn has four alternatives. He may: (1) close his plant: (2) limit his operations to the brief period when comparatively clean corn can be produced between generations of the borer: (3) continue to operate at a greatly reduced speed and increased cost; or (4) treat his corn with a suitable insecticide and continue to produce a normal or near normal pack.

In past years it was generally agreed that the industry could not afford to increase the cost of corn $3 to $5 per ton by adding the direct cost of insecticide applications. However, two years of research have apparently demonstrated the fallacy of this assumption. The benefits to be derived from corn borer control are reflected in many ways and several gains and savings contribute toward paying the bill. The yield of corn per acre may be increased by 10% to 20%; by reducing trimming losses,

One or two applications of spray or dust may practically eliminate stalk and leaf damage. In this field, one treatment made a difference of 10 bushels per acre in harvested crop.

the cases of corn per field ton may be increased by 10% to 15% or more; labor requirements on sorting and trimming belts may be reduced as much as 75% to 80%; and, by making it possible for the plant to operate at full capacity over a longer period of time, the per case overhead operating cost may be materially reduced.

Rarely, if ever, will it be advisable for the canner to treat all of his sweet corn acreage. Under Illinois conditions where early plantings of rapidly growing field corn normally absorb most of the first generation infestation, canning corn usually escapes serious infestation in June and early July. Often only a small portion of the earliest planted and most rapidly developing corn is subject to first generation infestations which will justify one or more applications of insecticide.

When the moths which will produce the second generation of borers appear in August, they tend to select fields of corn in the late whorl, tassel, or early silk stages of development. Therefore, plantings made in mid-June which will come into tassel in August and be harvested in September usually develop the highest borer infestation. Corn that is three or more weeks from harvest when eggs begin to hatch frequently requires three or four applications of insecticide to give the desired degree of protection. All available experimental data seem to indicate that for the control of second generation borers, the first application of insecticide should be made when hatching is first observed in the field, and that repeated applications should be made at 5- to 7-day intervals. Since young borers tend to feed on the husks and silks for at least ten days before they attack the kernels, it is doubtful if an insecticide applied to corn 10 to 15 days before harvest will be of any great value in protecting the ear. Fields that are within 3 weeks of harvest may not require more than one or two treatments, depending upon their age.

The Seed Producer's Problem

THE hybrid seed corn producer plans many strains and crosses of corn which require the full growing season in which to mature. He is therefore anxious to plant as early as possible and avoid the risk of having soft, immature corn in the fall. He does not object particularly to the presence of a few borers in some of the ears, but does object to excessive leaf and stalk damage which have a direct bearing on the yield and quality of the corn produced. Since the producer is fundamentally interested in a finished crop of high quality and maximum yield and since the removal of excessive moisture from late corn is a fairly expensive operation, many producers would prefer to plant at the earliest possible date and protect their crops by the use of insecticides, rather than risk the hazards of late planting. Furthermore, early planted fields which will be well past the tassel stage in mid-August will develop little or no second generation infestation. The production of hybrid seed corn is a fairly expensive operation and many producers are conservative in planning production that will little more than cover their sales requirements. Such operators dare not risk disastrous corn borer losses and reportedly plan to adopt the use of insecticides as a matter of insurance.

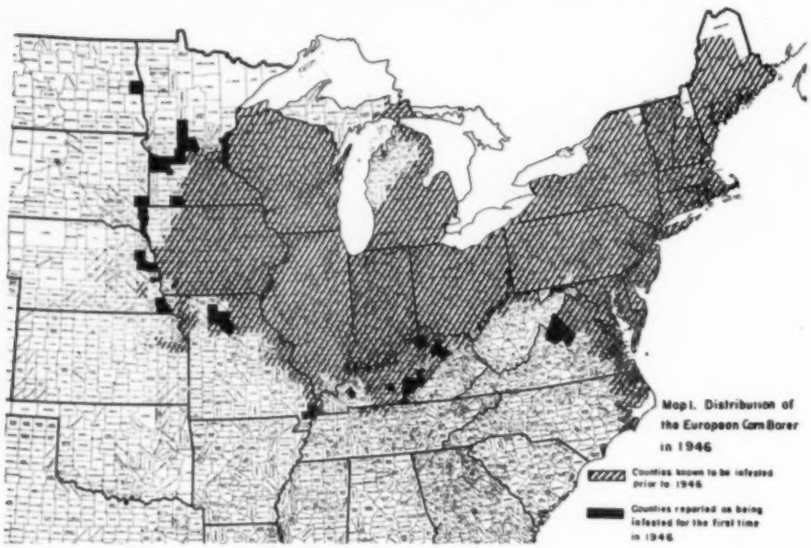
The seed producer who raises inbreds, single crosses and double crosses naturally has many fields which vary greatly in their susceptibility to corn borer attack and differ in cash value. Logically, therefore, he may wish to vary the number of insecticide applications made on different fields, depending upon the value and susceptibility of the crop. We have already noted that the seed producer is primarily interested in preventing leaf and stalk damage and that insecticides are most effective in preventing this type of injury. Therefore, the desired result may be obtained in many cases by the use of one or two well-timed applications of spray or dust.

Stalk damage and leaf breakage found in untreated field corn affect efficiency of plant and reduce number of ears produced as well as the size of ears and quality of the crop.

The Grower's Problem

GROWERS producing corn for grain face problems like those of the seed producer except that the former's crop is lower in value and so any increased yields per acre would have to be correspondingly higher to

Extent of Corn Borer Infestation During 1946



cover the cost of treatments. While it is doubtful if the average corn grower could in many instances use three or four applications of insecticide with profit, there is ample evidence to show that under fair conditions of heavy borer infestation, one or two timely treatments may be exceedingly profitable. Several Illinois farmers who made early plantings on highly productive soils have reported that one or two airplane applications of dust resulted in increased yields varying from 5 to 30 bushels per acre. Certainly, at the present time we are not in a position to encourage the widespread use of insecticides on ordinary field corn but we should not ignore the avowed intention of a number of farmers who, on the basis of last year's experience, plan to plant early and use insecticides.

What would happen to the corn borer population in a given community if a fair percentage of the corn producers were to adopt this policy of planting a portion of their acreage early, trapping the borers in such plantings, and destroying them by the use of insecticides presents a wholly unexplored field in corn borer control activities. Any trend toward a program of this type should be followed closely by entomologists, agronomists, and corn producers alike.

Insecticides and Application

WHILE the use of insecticides for the control of the European corn borer will remain the subject of many intensive research projects for several years to come, the results obtained in large-scale experiments during the past two years seem to offer ample proof that under conditions of heavy borer infestation the use of insecticides is both economically sound and practical.

At the present time DDT and Ryania appear about equally effective and stand at the head of the list of insecticides tested in corn borer control investigations. Rotenone, which was once considered in first place, now undoubtedly ranks third. All three may be use effectively either as sprays or dusts.

DDT is offered in so many varied concentrations and forms that for the present, one may go no further than to suggest that concentrations and rates of application be adjusted to apply from 1 to 1¼ pounds of actual DDT per acre per application. Ryania has been most frequently used as 4 pounds of the pure material per 100 gallons of water in a spray applied at the rate of 150-200 gallons per acre, or as a 40% Ryania dust, applied at the rate of 40 pounds per acre. However, reports from many sources seem to indicate that the amounts suggested and rates of application are subject to considerable variation. Rotenone is usually applied as 4 pounds of a 5% powder in 100 gallons of water, or as a 1% dust applied at rates comparable to those given for Ryania.

Generally speaking, spraying or dusting with either airplane or ground equipment has given rather consistent favorable results. Much additional data may be needed to establish the superiority of any one method of application, but for the present all may be regarded as useful. Each method of application presents certain advantages and disadvantages which must be taken into account. Many entomologists are inclined to feel that sprays applied with good ground equipment are the most efficient and most economical, followed in order by dusting with good ground equipment and aerial applications of sprays and dusts. The differences between methods, however, apparently are not large and for the present, at least, the choice of a method of application should be left to the individual grower. Certainly airplane dusting, which may be the least efficient and the most expensive, has proven its worth in Illinois and, considering its many advantages, the airplane may continue to apply most of the insecticides used in corn borer control.

Until such time as additional research justifies the development of definite spraying and dusting schedules, market gardeners and others interested in approaching perfection in corn borer control, will undoubtedly find it necessary to apply four or more treatments. Growers using reduced numbers of treatments will have to rely principally upon their own good judgment and the suggestions of available advisers in timing their applications.

Residues

DDT, the insecticide most commonly used on corn in Illinois, is known to be toxic to man and animals as well as insects and some thought should be given to the residue problem. Chemical analyses of var-

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California's problems in spraying for

Plant Disease Control

by

C. Emlen Scott

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IN the development and application of plant disease control methods, one must bear in mind constantly their influence on *quantity*, *quality*, and *economy* of production. Disease control with sprays and dusts has a marked influence on these three profit determining factors. This is particularly true of most fruit and nut crops and to a lesser degree of vegetables under dry summer conditions in California.

Because of great differences in climate, particularly in rainfall, spray programs may differ sharply for districts not more than 50 or 100 miles apart. In fact only one fruit tree disease, leaf curl, is present throughout the state and must be controlled annually in all areas. Another climatic factor which influences spray programs in California is the occurrence of warm winters. In southern California, the San Joaquin Valley and the central coast counties, the winter months are frequently so warm that many kinds of fruit trees will not start growth normally in the spring. When winter chilling is inadequate, blossoming is delayed and the period of bloom greatly extended. With apricot, a long blossoming period increases the danger of brown rot blossom blight, and with pear it increases the fire blight problem. With stone fruits there is apt to be very little foliage showing until long after petal fall following a warm winter. With peach, for example, this means that a leaf curl spray may be applied successfully at or near blossom time in warm winter areas. However, in the Sacramento Valley such a late spray is apt to fail because leaf buds and fruit buds start so nearly at the same time.

Chemical sprays are applied for various purposes, chief of which are for disease control, insect control, supplying minor elements, and in some cases to break the rest period. With nearly all California fruit and nut trees, a disease spray schedule may be influenced as to timing or compatibility by the need for combinations of two or more chemicals for these different purposes. Certain compromises must often be made. Adjustments are made according to the relative importance of the several troubles for which the spray is designed. The situation with vegetables is less complicated because most of these crops are grown during the rain-free summer when foliage diseases, except powdery mildew, are of minor importance. Celery is the principal exception, as much of it is in the field during the rainy season when Septoria blight must be controlled. Certain other vegetables, particularly peas, onions and a number of seed crops are damaged by foliage diseases which should be amenable to control if more economical methods of application were available. It appears there is considerable opportunity for expanding the use of fungicides in this field.

Orchard Diseases

ORCHARD diseases, that is, those which should be controlled by a spray or dust, may be classified as follows: 1. Those for which a satisfactory control is in general use. 2. Those for which a control is known but is not in general use. 3. Those for which no control is known. How should the greatest efforts be directed, and where should the most emphasis be placed when all of these implied problems cannot be attacked at once? For the first group it would seem that the biggest advances can be made in the development of equipment which will apply liquids more rapidly and more economically than can be done with conventional sprayers. Some of the improvements in applicators were described by O. C. French in the December issue of *Agricultural Chemicals*. Some of the new organic fungicides will find their place in this group of

New application machinery plays important part in controlling various plant diseases in California. Good opportunity for custom sprayers with "knowhow" and good equipment.

diseases, but they are not likely to effect major economies unless they enhance the usefulness of modern applicators. Many of the California fruit tree diseases in this group are controlled satisfactorily by Bordeaux mixture or fixed coppers, and plant injury is not so important. To supplant these copper sprays successfully, an organic fungicide must be enough better to reduce the number of applications, or be equally as good, but cheaper. In this connection it should be emphasized that this means the dormant and delayed dormant sprays on apricot, almond and peach which do not involve foliage. For Coryneum blight or shot-hole, a disease of major importance on apricot and peach, it is necessary to keep the twigs and buds protected with a fungicide from early December until blossom time.

Powdery mildews have been mentioned as predominating foliage diseases under semi-arid conditions. The relative cheapness of sulfur and its high efficiency in mildew control poses a difficult problem in finding a substitute. But there is a need for a fungicide effective against powdery mildews for plants which are sensitive to sulfur. Even with crops such as grape which are sulfured regularly, fruit and foliage injury during periods of high temperature can be serious. This phase is being somewhat neglected because so much of the fungicide work is directed toward wet weather problems.

The second group of diseases for which control is known but not in general use, is more difficult to discuss because so many factors can be responsible for certain spray programs not being widely used. In general, this group is composed of diseases which cause serious loss only in occasional years. Several common diseases must be controlled annually in certain areas whereas the same disease may be of no concern to growers a hundred miles away. There is no difficulty in deciding whether to adopt or to omit a spray program at these extremes, but the problem centers on the grower in the intermediate zone. Pear scab disease affords a good example. In only one California pear district is scab control absolutely necessary. In other districts, growers have been uncertain about applying 2 or 3 special sprays which frequently result in more financial loss than the disease might cause. This particular problem appears to be satisfactorily solved by the safer organic sprays such as the carbamates (F.D.D.C.). This material will no doubt extend the use of scab sprays to a much larger acreage than has been sprayed in the past. We have not been so fortunate so far with walnut blight. A cheaper method of application of sprays to walnut trees would help some but our greatest need is for a good and safe bactericide. So far, none of the organic fungicides has proved superior to copper sprays.

In recent years new spray machinery alone has contributed heavily to the almond industry of the state. In two districts where Coryneum blight frequently caused extensive damage, conventional sprayers could not be used economically because of difficult terrain or lack of water or both. Air-blast sprayers, applying 20 or 30 gallons of concentrated spray material per acre have afforded satisfactory control during the past 5 years. Elsewhere, we find a definite trend toward the use of concentrated sprays to replace conventional sprayers in apricot, almond, peach, plum and prune pest control. Air blast sprayers are now applying most of the standard fungicides and insecticides as well as minor elements. There is no doubt that the newer chemicals will extend the use of such machines by opening up new fields of pest control as well as affording economies in application costs.

Some of the modern spray equipment is too costly for small acreages. The owner of a small orchard is reluctant to replace his old sprayer with a new one because the new one within his price range would not make the job much easier or faster. This affords an opportunity for the commercial or custom spray operator who can manage to buy large labor saving sprayers. Custom spraying can be quite satisfactory where the control schedule, as with peach leaf curl, does not require critical timing. But for those diseases in which present methods require accurate timing as related to bud development or weather conditions, custom spraying presents some difficulties.

Perhaps this is an additional challenge to plant pathologists to develop different methods of attack which place less reliance on protective sprays. A good start has been made in this direction with the development of eradicant fungicides. In one California apricot district a dormant spray of mono calcium arsenite to destroy the overwintering phase of brown rot is now the standard practice. Extensive tests of sodium pentachlorphenate as a delayed dormant spray on almond are giving encouraging results in the control of brown rot blossom blight and shot-hole (Coryneum). In both cases, standard protective sprays at their best have not afforded satisfactory control and had to go on at an exact time. The eradicants are less critical as to timing and may reduce the total number of sprays. Some newer materials which look promising will encounter considerable resistance because they are disagreeable or worse when applied with a spray gun. Here again is an opportunity for new materials and new equipment to advance together. It is possible that equipment manufacturers haven't seen the changing picture as clearly as the chemical producer. Better coordination of these activities is sorely needed.★★

Plant Food Council Meets; Endorses Research Program

THE United States "has no practical alternative" to a national agricultural policy of "organized, sustained and realistic abundance," Secretary of Agriculture Clinton P. Anderson told the annual convention of the American Plant Food Council in its meeting at Hot Springs, Va., June 14. The meeting continued for three days, beginning June 13. Secretary Anderson went on to say that such a policy of abundance will call for the use of plant food materials "to a greater extent and in perhaps different ways than ever before."

"One point that seems fairly certain is that in the future, we are going to use plant food materials for conservation and improvement of the soil to a greater extent than in the past," he said. "This may not mean we will use any less for the old purposes, production of cash crops, but I predict farmers in the future will plan their use of fertilizers much more carefully." He indicated that this planning will be used to develop safer and more profitable systems of farming and to widen the range of crops they can grow and thus to diversify their operations. "In short," the secretary stated, "it will be used to improve total farm management."

In speaking of a national fertilizer policy, Mr. Anderson said that he favored one that "will fit in with the sound long-term objectives of agriculture" and which "should aim toward widespread adoption of better farming systems, development by private industry (including cooperatives) of adequate production and distribution facilities to supply farmers the plant food materials they want at fair prices, and the exploration . . . . of fertilizer mineral deposits." He emphasized the fact that increased research and education will be helpful in achieving these ends.

The Secretary expressed concern about the recent action of the House of Representatives in passing the USDA Appropriation bill which would "cut the Agricultural conservation program by about one half this year and would kill it completely next year." Other effects of the bill would "knock out the farmer-committee system for democratic formulation and administration of conservation, price support and other programs, cut out the work of the soil conservation service, seriously interfere with the established government policy of extending credit and stop a number important research projects, including some on soils and fertilizers."

Prof. Emil Truog, chairman of the Soils Department of the University of Wisconsin, in discussing the use of fertilizer materials in the midwestern part of the U. S., attributed the "phenomenal" increase in fertilizer consumption there to "high farm prices" and a "realization by the farmers of the urgent need and advantage of such usage." He noted

Clifton A. Woodrum, A.P.F.C. President, delivering his annual address at the Hot Springs convention, June 13, 1947.

Above: (L to R) Oscar F. Smith, president, Smith-Douglass Co., Inc., Norfolk, Va.; G. C. Briggs, vice-president of Armour Fertilizer Works, Atlanta, Ga.; John E. Sanford, president of Armour Fertilizer Works; and A. Lynn Ivey, president, Virginia - Carolina Chemical Corp., Richmond, Va.

that the annual usage of fertilizer in the midwest had risen from less than one million to over two and a half million tons in the 1940-46 period.

Although the use of fertilizer has in the past closely paralleled the rise and fall in farm prices, Prof. Truog expressed doubt that this would be the case in the midwest. The growers there have realized "the urgent need and advantage" of using commercial fertilizer materials on the soil. As an example, he pointed out how the influence of an extensive statewide extension program in Wisconsin began to have a marked effect in 1940. The demonstrations, inaugurated several years earlier, involved hundreds of thousands of chemical soil tests and hundreds of field fertilizer experiments, and provided many farmers with information which they had not possessed previously. The indications are, said Prof. Truog, "that when farmers once become adequately informed of the need and advantage of using fertilizer, they may greatly step up their demand . . . even though farm prices are not unusually high." Prof. Truog qualified this statement by saying that the total usage of fertilizer will be influenced greatly by farm income, but it will fluctuate less in the mid-west than it has in the past in the Cotton States. He predicted that eventually the mid-west will use ten million tons of fertilizer annually.

A breakfast forum of agricultural editors, under the chairmanship of Dr. Paul D. Sanders of the *Southern Planter,* Richmond, Va., emphasized the importance of fertilizer, mechanization and maintenance of soil fertility in achieving a program of "balanced abundance" in agriculture. Other editors participating in the forum included Robert H. Reed, editor of *Country Gentlemen,* Philadelphia; Ray Yarnell of *Capper's Farmer,* Topeka, Kansas, and W. G. Lassetter of *Progressive Farmer.* In his talk, Dr. Sanders praised the fertilizer industry for its wartime record of production, and paid tribute to the system of free enterprise. In commenting on the latter, Dr. Sanders stated that he is "emphatically and unalterably opposed to public policy that in any way would jeopardize the private control of the fertilizer industry which has just written one of the most heroic chapters in the entire war period."

Mr. Yarnell stated that "scarcity has no place in the American way of living," and emphasized that balanced production on farms does not mean excessive production nor exploitation of the land, but helps put back into production worn out soil by returning its fertility removed by crops.

Both Mr. Lassetter and Mr. Reed emphasized the importance of plant food in maintaining soil fertility. Mr. Lassetter indicated that through the use of plant food, the southern farmers "hope to defend themselves against the lower prices for their products which they expect." Mr. Reed predicted accurate plant food prescriptions for individual pieces of ground, rather than "shotgun" recommendations in general terms. He told of a recent trip to the midwest where the growers are very fertilizer conscious, stating that he heard "more talk of fertilizers than ever before" and "found more experimental work under way or starting, than ever before."

Clifton A. Woodrum, president of the Council, told the convention that "agricultural research is serving as a beacon to keep farmers and industry from the rocks of economic disaster," and that it is therefore important to assure our recognized Governmental agricultural agencies uninterrupted scientific progress. He pointed out how the fertilizer industry has always been "a beneficiary and strong supporter of agricultural research and education," and that the industry for many years has invested heavily in such programs ". . . We join with all agricultural producers and their organizations in support of sound research and educational programs which are essential to a self-sustaining farming program."

Mr. Woodrum, in speaking

Above (L to R) Professor Emil Truog, chairman, Department of Soils, University of Wisconsin, Madison; Dr. John R. Taylor, Jr., Agronomist of the A.P.F.C., and Carl Orth, Terre Haute, Indiana, a national winner, 4-H field crops contest.

for the fertilizer industry, said that few can boast of a "production record more than double the pre-war average, plus substantial improvements in their product, and at the same time keeping prices at a level that is relatively the lowest of any major item entering into the cost of agricultural production." He said that the industry has under way a vast expansion program, but the lack of building materials, machinery and transportation facilities has limited progress. Despite these difficulties, he said, "American farmers in the fertilizer season ahead will receive more plant food than at any time in history."

Dr. Firman E. Bear, chairman of the Soils Department of the New Jersey Agricultural Experiment Station, New Brunswick, N. J., replied to critics who assert that chemical fertilizers are injurious to health, by stating that the average life expectancy in the U. S. has increased in about the same proportion that fertilizer tonnage has expanded. Dr. Bear stated that while one would hesitate to claim that fertilizers are responsible for the 26-year longer life expectancy of today over that of a hundred years ago, it is certainly difficult to find a case against fertilizers on this score. (Dr. Bear had pointed out that the increase in longevity since 1850, when farmers began to use fertilizer, has jumped from 40 years then to 66¼ years at present.) The purpose of fertilizer, he said, is to add nutritive value to crops. "Our primary objective is to produce high yields of high quality crops. Yields can be measured by scales, but quality is often measured by the senses," he said.

He pointed out the way that animals decide by taste whether or not a crop has quality. "Livestock will often avoid manured grass to the point almost of starvation," he said. "But they will pick out a chemically fertilized grass plot, no matter how small, and chew it down into the soil. They need something the fertilizer supplies. It has been repeatedly shown that emaciated, listless livestock can be made to flourish when their impoverished pastures are treated with chemical fertilizers, especially those that supply phosphate."

Rep. Harold D. Cooley of North Carolina, member of the House Agricultural Committee indicated in his talk that "the fertilizer industry should be given every opportunity to expand facilities and increase production, and that only as a last resort should the Government invade this field." Mr. Cooley made a plea for increased world commerce, expanded research and more widespread knowledge of marketing in the U. S. "The field of agricultural research and marketing has been sadly neglected.

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New Directors Named

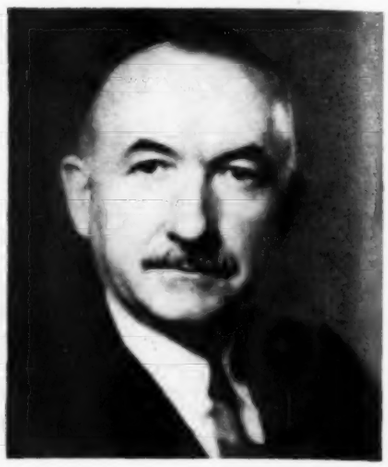
NINE new directors were elected to the board. Eight will serve 3 year terms which expire June 30, 1950, and Irving Morgan, Farmville Oil & Fertilizer Co., Farmville, N. C., will fill the unexpired term of the late Bayless W. Haynes. The new 3 year board members include the following:

J. ALBERT WOODS
Wilson & Toomer Fertilizer Co.,
Jacksonville, Florida
RAY C. ELLIS
Ellis Chemical Company,
New Albany, Indiana
WM. B. TILGHMAN
Wm. B. Tilghman Company,
Salisbury, Maryland
ROBERT C. SIMMS
Naco Fertilizer Company,
New York
R. R. HULL
I. P. Thomas & Sons Co.,
Camden, N. J.
S. Y. PRIDDY
Chas W. Priddy Co.,
Norfolk, Virginia
MAC C. TAYLOR
Oregon-Washington Fertilizer Co.,
Seattle, Washington
G. W. COVINGTON
Gulfport Fertilizer Co.,
Gulfport, Mississippi

Newly-elected members of the Executive Committee are C. B. Robertson, Robertson Chemical Corporation, Norfolk, Va., and George E. Petitt, Potash Company of America, New York. These men succeed H. M. Albright of United States Potash Co., New York, and Ralph B. Douglass of Smith-Douglass Co., Norfolk, Va., retiring chairman of the executive committee who was given an official tribute at the meeting. A new chairman will be named at a later date.

Maurice H. Lockwood
NFA President, gives keynote address

Dr. Jackson B. Hester
Says use of fertilizer will increase



Dr. C. J. Chapman
Tells of great potential in midwest

National Fertilizer Sec'y. Anderson's

THAT the fertilizer industry should take a stand in favor of the new fertilizer bill sponsored by Secretary of Agriculture Anderson, was reiterated by Maurice H. Lockwood, president of the National Fertilizer Association at the group's 22nd annual convention at Spring Lake, N. J., June 19, 20 and 21. The gathering which attracted some 450 registrants, was held at the Essex and Sussex Hotel.

In his keynote address, Mr. Lockwood urged the industry to take a positive stand on legislation. "The need for a national policy program on soil resources is obvious," he said, but the industry could not accept the provisions contained in proposals such as S. 1251 and H.R. 3421 for a number of reasons, which he reviewed. These objectionable features included provisions for the building of government fertilizer plants with subsequent commercial production and distribution by the government; the proposal of new and too expensive agencies and programs to place unreasonable burdens on taxpayers, and drastic controls over public land deposits of fertilizer minerals. He told the convention that it is not enough to be *against* proposals, but that the opportunity is here for constructive suggestions.

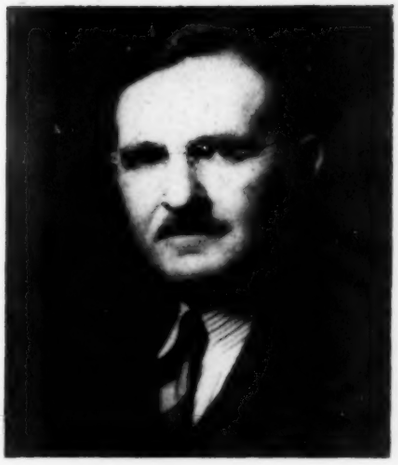
Discussing briefly the significant features of the bill presented on June 4th by Secretary Anderson to the Senate Agriculture Committee, as a substitute for S. 1251 then before the committee, Mr. Lockwood stated that if the Anderson bill were enacted it would establish a national policy on soil resources of the nation. "It would establish research on soil management including the use of liming materials and fertilizers as appropriate steps in improved soil management," he said. "It would broaden present demonstration programs through State and Federal agencies already existing. It would set up an advisory committee including farmers, land-grant college officials, and representatives of the fertilizer industry. It would authorize the collection of information concerning the needs for fertilizer and our industry's productive capacity. It would authorize the Secretary of the Interior to survey, investigate and explore deposits of lime, phosphate, potash and other deposits of fertilizer materials in the United States. It would authorize the setting aside of fertilizer mineral reserves in the public domain as a public trust. It would authorize the formation and operation of State advisory committees to cooperate in such a national program."

Mr. Lockwood commented that while there may be certain points in the proposed bill with which the industry may differ, the proposal deserves the careful consideration of the industry. He reminded the group that the new bill does not include features authorizing either Government fertilizer plant construction nor commercial production of fertilizers by Government. Free distribution of fertilizer to 2 percent of the nation's farms is also omitted. The bill would specifically authorize a sound expansion of fundamental and applied research and a demonstration program within reasonable limits and through already established state and federal agencies. The NFA president doubted that immediate legislative action on Secretary Anderson's bill might be inadvisable, and suggested that this fall might be an appropriate time for action.

As an effective means "to quiet the clamor for Government intervention in production and distribution," Mr. Lockwood stated that

Glenn A. Cumings
Describes new application equipment

W. T. Hart
Reports World's supply of Nitrogen



Weller Noble
Presides at all Convention Sessions

Association Backs Proposed Bill

greater production will go a long way in this direction. He estimated the production of fertilizer materials will be 8 percent more than the year just ending . . . "if we have no serious interruptions of fuel, power, transportation or labor . . . and . . . on the assumption that no larger quantities of domestic fertilizer supplies will be exported than during this year."

Dr. G. Scott Robertson, director of the Agricultural Production and Scientific Division, Food and Agriculture Organization of the United Nations, presented a picture of the world food situation. He recounted the history of food supply in various nations, then pointed out that we "can and must solve the problem of feeding the peoples of the world . . . It cannot be solved for one country at the expense of another or to the exclusion of another . . . it is impossible to escape the conclusion that we solve it jointly or we all sink." The chief goals of the F.A.O. are summed up in greater world production of food within a relatively short time, he stated. This end will be the result of applying our knowledge in preventing soil wastage by erosion, in increasing production by irrigation, by the application of fertilizers, and in the mechanization of the work on the land. He stated that the use of fertilizer materials in many of the backward countries of the world will be important factors. "Agriculture in India, China, Latin America and Europe will require far more fertilizers than have ever been thought of in the past," he said.

Explaining how a progressive attitude helps growers and the industry, Dr. Jackson B. Hester, soil technologist of the Department of Agricultural Research, Campbell Soup Co. told the convention that fertilizer analyses are changing as agricultural districts become older and the yields are increased. "In the past, growers have accepted such analyses at 4-12-4 and 3-12-6 and these have given a reasonable increase in yield. When they begin, however, to fertilize for optimum yields, they find that instead of a 4-12-4 mixture, the need is more nitrogen and potash." Dr. Hester then went on to say that magnesium and calcium become limiting factors in seeking maximum production, and later the trace elements such as boron, manganese, copper and zinc enter into the picture of complete plant nutrition.

"As the agricultural districts become older and the phosphate requirements become greater due to the removal of large amounts of potash and the depletion of the soil organic matter, fertilizer analyses should change to the 1-1-1 and 1-1-2 ratios." He pointed out that the public demands quality foods with high nutritional value, and this in turn depends upon fertilizer practices and the nutrients available in the soil.

He stated that the farmer is interested in the physical composition of fertilizer in addition to its value as a plant nutrient, since the grower is faced with the necessity of drilling the material. "With the change in formulation of fertilizer from the high phosphate mixture to the high nitrogen and potash mixture, a question of physical composition of a fertilizer becomes more of a factor from the standpoint of distribution," he declared. "The manufacture of satisfactory mixtures such as 10-10-10 carrying the necessary secondary elements, offers a challenge to the industry."

Dr. Hester related some of his experiences in studying the nutritional requirements of the tomato crop. He stated that the nutrients

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necessary to produce ten tons of tomatoes are as follows: calcium, 90 lbs.; magnesium, 15; nitrogen, 100; sulfur, 10; P_2O_5, 34; K_2O, 189; iron, .47; manganese, .65; boron, .05; copper, .08; zinc, .12; molybdenum, .003, and perhaps some sodium and chlorine. The second fact is that 3 percent of this plant food is necessary for the plant the first month after transplanting, 27 percent the second month, and 70 percent the remaining time. These requirements make it imperative that the fertilizer material be applied correctly and the problem of leaching be solved to prevent loss of plant food.

To raise tomatoes at the rate of 5 tons per acre, the average of the U. S., it would be necessary to apply only 500 pounds of fertilizer per acre (in New Jersey), and the most appropriate mixture would be 4-12-4. There would be no need to worry about secondary nutrient deficiencies because the average soil would supply them. But to double the yield, ten tons per acre, the nutrition problem increases in importance. To produce this yield, Dr. Hester suggested 1 ton of dolomite limestone, 1,500 pounds of 4-12-8 fertilizer per acre carrying 5 lbs. of borax to each ton. To raise the yield to fifteen tons per acre, the picture changes again. Although the phosphorus content need not be increased, it is necessary to increase the nitrogen and potash content as well as the secondary elements, calcium, magnesium, boron, and manganese.

"Methods of application of fertilizer in each of these cases on various soil types . . . should be different." he said. "For example, the 4-12-4 could best be applied by mixing in the row previous to planting. However, this would be unsatisfactory with the 4-12-8. Sandy soils could use 500 lbs. in the row and follow through with two sidedressings, or, on the heavier types of soil, the material used for sidedressing could be broadcast on the soil previous to planting. In the case of the 5-10-10 and 10-0-20 a similar procedure could be followed. The lime would have to be worked into the soil deeply."

Dr. Hester made a plea for the secondary elements, stating that although they are often regarded as relatively unessential, their importance in efficient crop production in the eastern part of the U. S. cannot be overlooked. He reported one instance where a magnesium deficiency cost one grower a minimum of $3,000. The deficiency was known by the grower, but ignored. Boron deficiency in Delaware caused complete defoliation of an otherwise satisfactory crop of tomatoes, he reported, and stated that such a lack has been noted in New Jersey and Maryland in addition to Delaware in 1946.

Because the N.F.A. Convention came so close to the publication date of AGRICULTURAL CHEMICALS, it was not possible to print in this issue the full text of any of the talks delivered at Spring Lake. However, our August issue will present at least two articles by convention speakers.

—THE EDITOR

W. T. Hart, Industrial Specialist, Office of Materials Distribution of the U. S. Department of Commerce, told the convention that although domestic production of Nitrogen is up, the world shortage of the material is estimated at from one million to two million tons. He said that the world prewar production averaged 2,442,000 tons pure N., and that the 1946-47 production is expected to be 2,555,000 metric tons, or an increase of some 113,000 tons. North America has become the world's foremost producer of Nitrogen, replacing Europe which suffered heavily from the war. Production in Canada and the U. S. for the 1946-47 year is expected to show an increase of 537,000 tons. Use of nitrogenous fertilizer materials in the midwest is increasing annually, he said, and stated that Iowa alone had increased its use from 9,000 tons to 215,000 within a relatively short time.

New developments in the field of fertilizer application machinery were pictured by Glenn A. Cumings, Senior Agricultural Engineer, Division of farm power and machinery of the U.S.D.A. Mr. Cumings described the needs for specialized machinery to place fertilizer materials the soil at levels below the seed, at the side, and as a top dressing. He told of the long research by the Bureau of Plant Industry, Soils and Agricultural Engineering to develop machines for various crops and conditions.

Some of the changes which are now creating new demands and new problems in application equipment were listed by Mr. Cumings. "The recent use, in many cases, of greatly increased amounts of fertilizer per acre" is one contributing factor, and others include the application of fertilizer in areas where little or none was used before, the interest in liquid materials, more general use of tractor power and heavier tractor-operated machinery, the desire to cover larger acreages per day with reductions in man labor and fewer interruptions, and the exacting requirements for individual crops and conditions resulting from increased scientific knowledge.

Mr. Cumings stated that numerous new machines had been devised to meet these modern needs. These can be generally classified in four groups to indicate typical new trends, he said. These are: tractor-mounted fertilizer equipment, equipment for deep placement of fertilizer, equipment for applying fertilizer in liquid form, and broadcasting equipment. Slides were shown picturing many of these new devices, and demonstrating the manner in which various fertilizer materials are deposited in the soil.

In discussing equipment for applying fertilizer in liquid form, Mr. Cumings stated that new developments in liquid fertilizer application differ from former conceptions of such operations in that the new developments are concerned with application of liquid materials by equipment on field implements rather than in connection with irrigation systems. He said that most of the systems were simple, depending upon gravitational flow of the material, but in some cases liquid pumps have been

(*Turn to Page* 69)

Chemical Fertilizers Essential to *Agricultural Abundance*

RECENTLY in testimony before the House Agricultural Committee, the Secretary of Agriculture reported his firm belief, backed up by facts and figures, that the one practical policy for American agriculture is that of organized, sustained, and realistic abundance.

If such a policy is to be put into effect, plant food materials will have to be used to a greater extent and in perhaps different ways than ever before. This may be an even greater challenge to the fertilizer industry than was the war and its aftermath—if a greater challenge is possible.

But before it is possible to work out a long-range program of plenty, the problem of the other extreme which confronts the world at this moment must be met. . . the problem of hunger—the world shortage of food. Plant food materials have a dramatic part in the epic tragedy now being enacted on the world stage. Plant food materials are so vital to the people of all countries at this moment that they are being allocated on an international basis just as the life-saving cereals are divided up by mutual consent. The great food requirement is grain, and the great plant food requirement is nitrogen. Not many know how difficult it is for the International Emergency Food Council to allocate the short supplies of nitrogen. The world outlook for phosphate has improved so that the shortage now does not appear to be serious, and there may be about enough potash to go around.

The shortage of nitrogen underscores the fact that the world cannot yet see the end of the food emergency. According to the IEFC, the world lacks more than a million tons of having enough cereals to maintain current rations throughout the world until the new harvests come in. Even with a record wheat crop in the United States, little hope is seen for any material increase in food supplies in 1947-48. Export supplies of fats and oils are only 60 percent of prewar. Export supplies of rice are less than 30 percent of prewar. Sugar production is picking up but is still below prewar. Europe has 40 percent less meat than prewar. Supplies of other foods are down also. And population, in spite of the war, is up.

It was with this situation in mind that the U. S. Secretary of Agriculture recently recommended that the IEFC call a meeting of the head food and agricultural officials of all countries to try to work out improvements in the conservation and distribution of food supplies in the needy countries.

It is with the same background in mind that manufacturers and distributors of plant food materials are called upon to dig in for a long fight against shortage and world hunger. American farmers have been doing a grand job of helping to prevent starvation. In this crop year they are supplying grain exports that probably will total about 550 million bushels with a shipside value of about one and a third billion dollars. That's not only a great deal of food but a lot of plant food too; plant food the fertilizer industry has helped supply. It has also helped make plant food available to other countries so that they could rehabilitate their own agriculture. There is reason for pride but not for complacency.

Now to jump from the immediate world emergency to consideration of long-term problems of *American* agriculture. It may seem at first that this is a big jump in our thinking. But don't be too sure. Before the extreme world demands on our production ease off, our future course must be planned. Potato surpluses for several years have given us a foretaste of bitter conditions that could become general if the nation is unprepared to deal with them. Also, greater demands have been and are still being placed on our soil resources than can be continued indefinitely. Now is the time to decide—not merely, on the negative side, how to have protection against postwar problems that may arise, but also, more positively, to set objectives and plans that are really wanted. The future use of plant food materials will be affected by the decisions made. At the same time, our knowledge of, and supplies of, plant food materials will undoubtedly affect these decisions.

One point that seems fairly certain is that in the future plant food materials will be used for conservation and improvement of the soil to a greater extent than in the past. This may not mean that any less will be used for the old purposes, production of cash crops, but farmers in the future will undoubtedly plan their use of fertilizer much more carefully. They will use it to develop safer and more profitable systems of farming. They will use it much more precisely to meet the needs of particular fields and farms, to widen the range of crops they can grow and thus to increase the opportunity for diversifying their operations; in short, they will use it to improve total farm management. In saying this, it is assumed that it will be possible to go ahead with the reseach work and demonstrations and other educational work that will make such a trend possible. The Secretary of Agriculture is on record as favoring the establishment of a national fertilizer policy that will fit in with the sound

by

Clinton P. Anderson*

United States Secretary of Agriculture

long-term objectives of American agriculture. The fertilizer policy should aim toward widespread adoption of better farming systems, development by private industry (including cooperatives) of adequate production and distribution facilities to supply farmers the plant food materials they want at fair prices, and the exploration, utilization and conservation of fertilizer mineral deposits. Increased research and education will help us achieve those ends.

It is highly significant that the plant food industry is devoting a great deal of thought to national agricultural policy. It shows a feeling for the importance of business that extends beyond the dollar sign. It is a matter of sincere pride that the products and efforts of the industry help to safeguard the nation's food supply and will help to develop a permanent and profitable American agriculture. It is significant too that some effort is devoted toward giving other people this concept. For those who stop to think, it is the simplest thing in the world to understand that everyone has a personal interest in the soil and in the conduct of agriculture.

Once this personal interest is realized, there should be little difficulty in getting together on long-range policy. Programs to implement policy are another matter. How to go about reaching these objectives depends on general economic conditions in the nation and the world, on changing demands, on soil and climatic conditions. But it is important to set a course.

The Department of Agriculture has assembled and analyzed many facts and figures relating to the future of agriculture. Several conclusions have been reached: Buying habits of people with a fair income show that the people want much more of what farmers can produce. Farmers have the productive power to supply the wants of the American people and to participate extensively in world trade. Farm production will inevitably continue to increase with improvement in technology and soil conservation. Better use of our agricultural resources — development of a permanent agriculture—is essential to our own future. And, fortunately, the kinds of farm products which people want in greater amounts are the kinds of things possible to produce if the Nation's resources are properly used. In other words, the wants of the people, the needs of the soil, and the necessity of preventing wasteful surpluses all point to increased future emphasis on livestock farming.

Think for a moment what that may mean in terms of soil balance and in terms of plant food materials. In using the soil, the balance is constantly being changed by adding to and taking out. It's like using a checking account at the bank. Throughout history, there has been more taking than putting. Taking out is done in these ways: the organic matter and nitrogen is reduced through intensive cultivation; mineral plant food is removed by taking off crops; erosion losses are permitted; the soil is allowed to pack or otherwise lose condition for good cultivation; and there are some losses by leaching. Putting back is done in these ways: organic matter and nitrogen is added in the form of plant roots and other crop residue and green manure crops—the use of lime helps do this; manure and commercial plant food materials are added; workability of the soil is maintained by growing inter-tilled crops less frequently; and soil losses are stopped through erosion control practices. It is plain that emphasis on livestock farming will help cut down the "taking out" process and speed up the "putting in" process.

There have been many striking examples of how plant food materials contribute to the success of livestock production. The U.S.D.A people at Beltsville recently reported an experiment in Maine. Use of lime and fertilizer tripled the production of forage and of milk, as compared with no soil treatment.. One type of treatment not only increased quantity but produced a forage nearly three times as rich in phosphorus and almost twice as rich in protein and calcium as that from the untreated plot. From many experiments it is known that fertilizers and lime make a tremendous contribution to the improved nutrition of livestock and the production of such protective foods as milk and meat.

Plant food men are familiar with the North Carolina corn experiments in which yield of hybrid corn was increased more than 70 bushels an acre by increasing the application of commercial fertilizer nitrogen. They also know about the work being done to increase corn yields through proper timing of fertilizer applications. This is a highly interesting field of study, indicating that the limits of increasing corn yields through the use of plant food materials have hardly begun to be reached. Already farmers are using two to three times as much fertilizer on corn as they did before the war, and it is estimated that fertilizer increased the 1946 crop by 100 million bushels.

These corn yield increases are important in themselves, but perhaps the greater significance is that they may enable farmers to use rotations that are better for the soil.

There is virtually no end to the factual evidence that wise land use and abundance of wanted products go hand in hand.

There is no practical alternative to a national policy of organized, sustained, and realistic abundance. People in the plant food business, like the farmer, have an opportunity to serve the national welfare as well as their own interests in helping to establish such a policy and to develop the programs to make the policy effective.

It is much easier to talk about these things than to do them. No country has ever followed a policy such as outlined here. No country

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* From address before A.P.F.C. Convention, Hot Springs, Va., June 14, 1947.

Chemical Application by

HELICOPTER*

A CONTINUOUS warfare against crop pests has been carried on by growers for hundreds of years, and many of the early methods used appear to us ridiculous and primitive in the extreme. Most of the effort was directed toward mechanical control, either by direct removal of the insect and affected parts of the plant, or by the use of repellents. History reveals that even charms and magic have been attempted from time to time.

Within the past 50 years, however, pest control has changed from hit-or-miss methods, to scientific and effective dusting and spraying control measures. Where toxic liquids were once applied with a whisk broom, and dust materials thrown on plants by hand, the mechanical means of application have come through a long evolution. Dusting and spraying equipment must meet many requirements. Toxic materials must be applied at the proper time and in the proper places to protect crops from insects and plant diseases. Many problems confront the user of ground equipment, particularly where the ground is wet, and where the plants are susceptible to being crushed by tractor wheels or the application equipment itself. Frequently in irrigated sections, it has been necessary for the grower to shut off the water supply and allow the soil to dry before he is able to bring machinery into the field. Under such conditions, it is difficult to time the application of sprays and dusts to the best advantage.

Effective control of insects and plant diseases, as every grower knows, depends upon dusting or spraying with the proper materials, doing it at the time an optimum kill may be achieved, and getting a thorough coverage of the insecticide or fungicide on the plant. A lack in any one of these essentials may mean a total failure of the objective, since each factor acts as a complement to the other.

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* Excerpts from Mr. Kelley's talk before the American Helicopter Society, Third Annual Forum, Philadelphia, Pa., March 27, 1947.

by

Frank H. Kelley, Jr.

Bell Aircraft Corporation
Buffalo, New York

Airplane spraying and dusting of plants was introduced into the picture some 26 years ago, in an effort to overcome some of the handicaps of ground application. For many years, development of airplane application was retarded by a lack of proper materials, and equipment, as well as by a lack of knowledge of this technique. In the early stages, planes were used primarily as a means to control the army worm on cotton crops in the south. Despite primitive equipment, the method proved valuable to the cotton industry because of the speed and timing of application.

In later years, however, particularly during the late war period, aerial application of insecticides and fungicides has developed rapidly, and in some sections of the country has largely replaced ground methods.

Numerous advantages are claimed for the helicopter over conventional airplanes in applying toxic materials for control of weeds, insects, and plant disease. It can travel at speeds of from 15 to 80 miles per hour, and can hover over selected spots until a thorough coverage of dust or spray is assured. Downdraft of rotors creates "boiling" effect of air which causes spray or dust material to "bounce," thus assuring coverage of both sides of leaves.

As an occupation, however, the work of crop dusting by airplane is considered a hazardous type of flying by the Civil Aeronautics Authority, insurance companies and other financial institutions. The necessity of low flying with its potentialities for collison with wires, trees, and other structures presents problems difficult to eliminate because of the speed with which the flight must be made.

A newer type of flying equipment has entered the picture, however, with the adaptation of the helicopter for this purpose. Users state that the machine answers the purpose satisfactorily, and that it would be difficult to devise a more efficient flying mechanism for the purpose of dusting, spraying and seeding. The rotors of the machine provide the motive for diffusing materials, with more than a million cubic feet of air being thrust downward each minute at a velocity of about 12 miles per hour. This force carries the insecticidal or fungicidal material down through the foliage and swirling upwards again to coat the under sides of the leaves and all surface parts of the plant. The helicopter can pass from tree to tree, pausing over each for treatment as long as may be necessary to insure effective coverage; or for large areas of infestation, it can fly at speeds of 15 to 80 m.p.h., leaving behind a swath of toxic material averaging 60 feet in width.

An established air field is not required for landing and take-off, and service points on or adjacent to each plot may be used. Any reasonably level and smooth area, free of obstructions for fifteen yards, is considered suitable for servicing with fuel and spray or dust materials.

The hazard of aerial application by conventional airplane is greatly reduced through use of the helicopter. The visibility and maneuverability are about 100%, and it is probable that night operation with a helicopter equipped with lights and with someone on the ground to assist, would be entirely feasible. Many insect pests appear only at night and should be attacked at this time.

With a range of low speeds and accurate control over height, a pilot trained to differentiate between infested and non-infested areas will be able to confine operations to the infested and immediately adjacent acreage, thereby using to the best advantage his supply of toxicants, and avoiding the danger of allowing the material to drift to other crops, cattle or personnel.

During this past summer, a Bell Model 47 Helicopter was sent to the Pacific Northwest for the purpose of designing, adapting and calibrating dust and spray dispensing equipment on various kinds of crops. The work was done in cooperation with recognized leaders of agricultural aviation and other agricultural specialists. During these tests, the helicopter dusted hundreds of acres of orchards, trellis and flat crops. Results were satisfactory, particularly insofar as the function of the helicopter was concerned.

Except during ideal weather conditions, all dusting was done during the early morning hours, usually starting after daylight and terminating when wind velocities exceeded fifteen to twenty miles per hour, or when the temperature went above 100° F. A few flights were made at temperatures of 103° F., and some flights were made during light rain.

Flat crops required a more exacting flight technique than did orchards and trellis crops. On orchards, it was found possible to go up one row and down the other, back into a corner and even to treat individual trees. It was found that with the helicopter, the principle of low velocity and high volume was being used for complete coverage of the treated crop.

On one orchard and with no attempt to see how much could be carried or how fast the dust could be dispensed, a record of loading, ferry and dispensing time was kept. Fourteen hundred pounds of dust were applied during 7 flights, over a 42 minute period. When carrying 400 pounds, this performance would

Helicopter application removes many "ifs" from use of aircraft in spray and dust operations on crops. No large landing fields necessary, and hazards of wires, trees and buildings are largely eliminated

average over 3,000 pounds of insecticieds application per hour of flight time. Once over the orchard, the hopper was not shut off and a flag man was considered unnecessary.

Another successful operation was blowing rain water off ripe, sweet cherries. It required twenty minutes flying time over thirty acres to dry the orchard thoroughly by pumping in fresh, dry air after a rain. From the success of this operation, it was concluded that the helicopter would be effective for controlling frost under certain conditions and evaporating moisture from peaches, tomatoes or fruits.

One test not originally planned was connected with cattle ranching. Some two hundred head of cattle were quickly rounded up and dusted. The helicopter was found to be an excellent vehicle for this purpose, and it was demonstrated further with talc that any other insecticidal material could be applied to the cattle, pens, backwaters and breeding grounds of mosquitoes and flies, for effective control. It was futher demonstrated that the helicopter was practical for fence inspection, location of strays, cattle counts and other ranching chores.

Of similar importance to agriculture are the possibilities of helicopter use in discovering and controlling brush fires in sections difficult to reach in any other manner. Although this hazard may not be of major importance to general agricultural practice, it is worthy of consideration in this regard.

Weed Spraying Important

ONE of the most important of recent agricultural developments is that of weed control by dusting or spraying with certain chemical herbicides. Weeds do damage estimated at at $80,000,000 per year to agricultural crops of the United States. This method of weed control has proved effective and offers unusual opportunities for aerial application.

The seeding of range lands and forest areas will no doubt also be done by aerial methods in the future. Millions of acres of waste lands can be restored by the proper and timely application of seed. Last winter, convential aircraft were used during an experimental program in the Tillamook Burn area of Oregon. The interesting part of this experiment is that it was necessary first to treat the area with poison seed to kill off the rodents, estimated to be nearly 13 mice per acre. These mice, if left alive, would eat all of the seeds that fell. Following the poisoning program, 4 ounces of forest seeds of various kinds were applied per acre. Much interest has also been shown in the use of the helicopter for the control of grasshoppers, and in patrol of irrigation systems for weed control, and vermin extermination.

Agricultural uses of the helicopeer so far mentioned, have either already been done by helicopter or by conventional airplane. Additional uses for the helicopter in agriculture have become evident in the application of defoliants, hormones and pollen. The helicopter is adaptable for applying all of these new materials.

Advantages of aerial application of spray and dust materials are considered to be rather numerous. They include rapid coverage with fewer man hours spent, the element of timeliness, if aircraft is stationed nearby when weather conditions are favorable, and the fact that crops may be treated without injury, even when the ground is muddy. It is also pointed out that the grower does not need to maintain other equipment, and that greater control is achieved through better coverage, particularly in the case of difficult high-growing crops. The matter of economy is influenced by a number of factors, not all of which favor aircraft application. Matters to be considered are the value of the crop to be treated, the extent of the area involved, the amount of coverage necessary, and the comparative cost of ground operation.

When applying such materials with the helicopter, however, a number of the "ifs" are removed, such as the need for ideal weather conditions, still air, and the absence of rising air which causes the dust or spray to float. Large landing fields are unnecessary, since the helicopter can land or take off from a small area, and it is possible for the pilot to communicate with persons on the ground. Hazards of wires, poles, trees and buildings are held to a minimum.

Experience with the helicopter as an applicator of spray and dust materials has established the fact that large volume of air at low velocity is provided by the down-wash of the rotors, giving complete coverage of even the heaviest foliage, allowing treatment of crops uneconomical to protect in the past. These include orchards, hops, corn, grapes and sugar cane among others. The controlled variation of swath width is noted as another advantage in helicopter use. Both speed and height can be regulated, making possible treatment of small as well as large plots. Application may be made in

high temperatures, or in fairly high wind velocities due to the controlled rotor down-wash.

In addition to using the helicopter as a crop spraying and dusting apparatus, the machine has other agricultural uses. A 400 pound disposable load may be carried, and the machine may further be used in a number of ways of value in agriculture. Custom sprayers in various sections of the country have become interested in the business possibilities of helicopter use. A comparative analysis of ground spraying equipment, airplanes, and helicopters reveals figures something like the following:

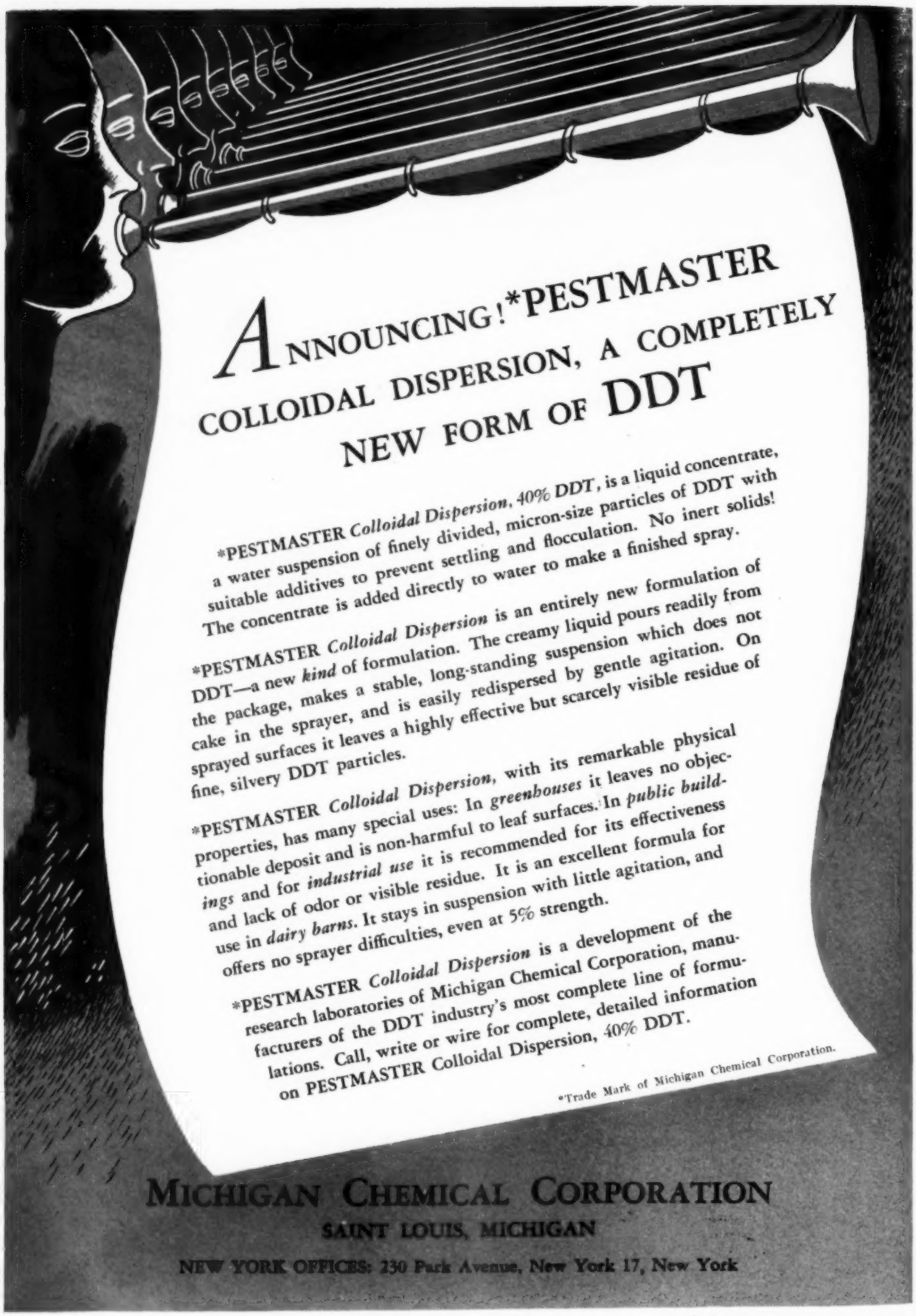
The most efficient modern ground equipment has a swath width of less than 30 feet and travels a maximum of 10 m.p.h. Under ideal conditions, it would be possible to treat a little more than one-half an acre per minute or 36 acres per running hour. The average conventional airplane has a swath width of less than 40 feet and flies at 90 m.p.h. Under ideal conditions, it would be possible to treat 7 acres per minute, or 420 acres per flying hour. Quite obviously, due to the necessity of landing at an established air strip for reloading and the necessity of maneuvering out of the field being treated for reversal of direction, the ratio of treatment time to flying time is low. A conservative figure would be 20% treatment time to flying time which would result in 84 acres per flying hour. The helicopter, with a swath width of 70 feet or less and an 80 m.p.h. treatment speed, could treat under ideal conditions a maximum of 672 acres per hour. However, to obtain maximum results a slower speed of perhaps 40 m.p.h., and a ratio of 80% treatment time to flying time would result in 268 acres per flying hour. This figure is over 7 times that of the ground equipment and over 3 times that of the conventional airplane.

Prices charged for airplane dusting at the present time, vary from about 50c per acre to several dollars, depending upon a number of factors, particularly the crop and terrain. At the minimum figure of 50c per acre, it should be possible for a sprayer to realize nearly $100 per hour for such service.

Comments from observers in the aviation and crop-dusting fields indicate that the helicopter is likely to replace many conventional planes in pest control work. According to H. A. Poulin, president of Central Aircraft Corp., the variable forward speeds and air effect make it possible to obtain the desired flow of materials for the particular result. Long ferry flights are not necessary from landing strips to fields being treated, he points out, and longer flying hours will be made possible.

These observations on the use of helicopters in agriculture will serve as a resume of facts thus far known about the machine and its possibilities. Doubtless, the future will see further developments and refinements in aerial spraying and dusting activities, but it is likely that the role of the versatile helicopter will continue to be prominent.★★

The down-draft of helicopter rotors plays an important part in minimizing drift of toxic materials, and in placing the spray or dust on the plants for which they are intended. Note almost vertical spiral of dust descending to ground from aircraft.



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Senate Committee hears Fertilizer Industry testimony against S.1251

REPRESENTATIVES of the fertilizer industry in testifying early in June before the Senate Committee on Agriculture and Forestry, indicated that privately-owned plants are capable of supplying needed fertilizer materials for the world without the construction of Government-owned and operated factories as provided in the proposed Hickenlooper-Flanagan bill, S. 1251. (The Senate Committee is composed of senators Arthur Capper (R), Kansas, chairman; George D. Aiken, (R), Vermont; Milton R. Young, (R), N. Dakota; Edward J. Thye (R), Minnesota; Elmer Thomas (D), Oklahoma; Allen J. Ellender, (D), Louisiana; Scott W. Lucas, (D), Illinois and Claude Pepper, (D), Florida.)

Ralph B. Douglass, vice-president of Smith Douglass Co., Norfolk, Va., and chairman of the Executive Committee of the American Plant Food Council, testified that he opposes the bill, first because it offers no cure as sound as projects already in existence, and second, because it would probably fail to provide supplies of fertilizer to growers as quickly as private industry will catch up with the demand if S. 1251 is not passed. He also stated that "The threat of TVA or government building fertilizer plants, acquiring phosphate deposits, and the making of government loans at low interest rates, will act as deterrents to expansion of facilities by private industry."

Mr. Douglass also told the committee that the fertilizer industry is vitally interested in research, and is carrying on an extensive program in that respect. He stated that research must be carried to the farmer by test demonstrations to serve as educational projects. Such demonstrations are not a new idea, he said. "They have been used extensively by present agencies of government, and I question whether new legislation is required for the continuation of what is already being done . . ." Mr. Douglas then quoted other authorities in the field revealing how demonstrations have been conducted over a period of years past. He also said that "there is no justification for TVA building more fertilizer plants anywhere. They already have at Muscle Shoals what is probably the largest phosphate plant in the U. S. . . . Surely it can serve any and all yardstick purposes."

Other witnesses also appeared before the committee and presented testimony. Among these was O. C. Metzger, president of the Ia-Conda Phosphate and Chemical Co., Perry, Iowa. He stated that his opposition to the bill was based on a number of premises, one of the strongest of which was the establishment of Government in the fertilizer business. "Private enterprise cannot survive with a competitor that can give away one-half of its product and may sell the other part for less than it cost to produce it," he declared, and continued by saying that such a condition might well remove sources of rock phosphate or potash or both, if the Government elected to buy or lease the properties of basic suppliers. "This would do nothing to solve the fertilizer situation except to bankrupt many small individual fertilizer companies . . ." Mr. Metzger predicted. He also saw in the bill possibilities for greatly expanded Government domination in the industry. "It is conceivable that Government could . . . acquire sufficient land containing fertilizer raw materials to the extent of discouraging the entrance of private industry into the raw materials field, or from further expansion of companies existing in this field," he observed, and stated that it is conceivable also that "the 9 million dollar expenditure mentioned might be blown up into astronomical figures at the expense of the American taxpayer."

Charles E. Heinrichs, in charge of the mining department of the Virginia - Carolina Chemical Corporation, Richmond, Va., testified that there are ample mineral phosphate reserves in the U. S. to dispel any fear of a shortage of this raw material. The U. S. has about 51 percent of the world reserves of phosphate rock, he said, and this supply is considered adequate for the needs of more than a thousand years. He stated that the phosphate rock industry has a good record of efficiency and leadership, and is capable of and willing to expand with private funds to the extent required by the nation's needs. "The cost of implementation of a phosphate mining program within the meaning of the bill would be costly, of doubtful value and totally unnecessary," he stated.

T. S. TenEyck, executive vice-president of the Ia-Conda Phosphate and Chemical Co., Perry, Iowa, condemned the proposed use of the blast furnace method in the production of high analysis fertilizers, as having been "already tried on a large scale production basis by private industry, and abandoned as too expensive when compared with the electric furnace or the wet process method." He pointed out a number of examples and stated that the estimated cost of a 9 million dollar "experimental plant" is most confusing to industry . . . especially to those who must finance their own companies. "For $9,000,000, industry could build in Florida a wet process triple superphosphate plant and produce just about double the tonnage of triple superphosphate which is estimated as the production of the proposed Mobile plant. We would certainly not call this a 'pilot plant' or 'experimental plant'," he declared. As to costs, Mr. TenEyck pointed out that private industry is at present selling triple superphosphate at less per unit than it costs TVA to produce according to their latest annual report. He called to the committee's attention the fact that industry has more than met the demands for concentrated fertilizers in all normal periods and confidently expects to meet the needs of the future as quickly as facilities become available to the industry.

The Midwest Increases its Use of Fertilizer

by Prof. Emil Truog*

Department of Soils, University of Wisconsin

THE most phenomenal increase of fertilizer usage on record in some respects took place in the Midwest during the years 1940 to 1946 inclusive. In the course of this period the annual usage rose from less than one million to over two and one-half million tons. The Midwest is the area commonly referred to as the North Central Region, comprising a block of twelve states with Ohio on the east, Nebraska on the west, Missouri on the south, and Minnesota on the north. It is estimated that approximately 60% of the food output of this country is produced in this area. That is why the Midwest is sometimes referred to as the Nation's bread-basket. The farmers in this region now use about 60 percent of the agricultural lime produced in this country. This use parallels food production. In the case of fertilizers, however, the usage even after the recent upsurge, is only 20 percent of the Nation's total.

Outstanding Agricultural Area

IN no other part of the world does there exist a similar large area of land so well adapted for the production of a combination of the staple food, feed, and forage crops; namely, corn, wheat, oats, barley, rye, soybeans, clover, alfalfa, and various hay and pasture grasses. The expression, "Corn is King," is well founded, because no other cereal can compare with it as a producer of feed for hogs and cattle, in both nutritive quality and acre production.

Large scale and profitable corn production requires a certain combination of soil and climate not found in most countries: the soil must be deep, loamy, high in fertility elements, well drained, and have a level or moderately level topography over extensive areas; the climate during a good share of a frost free period of four to five months must provide an abundance of sunshine, rather high temperatures, and a moderate but well distributed rainfall. In the so-called "Corn Belt," all of these conditions are provided to a degree and on a scale not found anywhere else. Many regions are unsatisfactory for corn production because they fail to provide one of the requirements, such as, abundant sunshine or high enough temperatures during the growing season.

The above discussion of the Midwest as a premier agricultural area, particularly as regards corn production, is given because of its bearing on some of the questions to be discussed.

The greatly increased usage of fertilizer in the Midwest raises three major questions which are of special interest to the fertilizer manufacturer and dealer. They are:

(1) What are the reasons for this phenomenal increase?

(2) How much higher will this usage go?

(3) If farm prices drop abruptly, will fertilizer usage also drop abruptly?

Reasons for Fertilizer Increase

IN considering the reasons for the increased fertilizer usage, there appears to be no question that a number of factors contributed to the increase. A high return for farm products was undoubtedly the major factor for the extended abrupt rise. However, if an urgent need for the fertilizer had not developed and existed, this rise would certainly not have occurred. In other words, a pent-up need for fertilizer had developed over the course of many years which needed only the assurance of a satisfactory financial return to express itself in the form of a record breaking demand by the farmers. As a matter of fact, fertilizer usage had started to rise rapidly in some areas of the Midwest just prior to a marked rise in farm income.

For example, in Wisconsin, the rapid rise started in 1940, which was prior to a marked rise in farm prices. In Iowa and Minnesota, this rapid rise did not get under way until two or three years later, although the farm income situation in these states was similar to that in Wisconsin, and the need of fertilizer in terms of tonnage may have been even greater. (Iowa has twice and Minnesota nearly twice as much land under plow as Wisconsin.) This tells us that factors other than farm income were involved. These included an awareness by the farmers of the actual need, and advantages to be gained in satisfying this need. These exert a strong influence on fertilizer usage.

In Wisconsin the influence of a state-wide extension program was being shown in 1940. This program, inaugurated several years before 1940, involved hundreds of thousands

* From address at American Plant Food Council Convention, Hot Springs, Va., June 15, 1947.

Demand potential for fertilizer materials far exceeds present supply. This season's use is so heavy that even small gardeners in midwest have difficulty getting enough.

of chemical soil tests and hundreds of field fertilizer demonstrations. This indicates that when farmers once become adequately informed of the need and advantage of using fertilizer, they may greatly step up their demand for this commodity even though farm prices are not unusually high.

This viewpoint is somewhat contrary to careful analyses recently made* showing that in the past the rise and fall of fertilizer usage for the country as a whole have paralleled closely the rise and fall in farm prices. In this connection, I wish to point out that the results of these analyses are based largely on the pattern of fertilizer usage in relation to farm income which prevailed in the South and South East. (Before 1940 these areas purchased approximately 70 percent of the fertilizer used in this country). In a region like the Midwest which has matchless agricultural resources and possibilities, it is doubtful that fertilizer usage will be tied so closely to farm prices in the future. Two main reasons, therefore, account for the recent greatly increased fertilizer usage in the Midwest, namely, first *high farm prices,* and second, *a realization by the farmers of the urgent need and advantage of such usage.*

What is the Saturation Point?

THE next question is namely: how much higher will fertilizer usage go in the Midwest, assuming continuance of a satisfactory level of farm prices? Close contact with the supply and demand situation in Wisconsin convinces observers that the present demand would absorb somewhere between 25 and 75 percent more fertilizer than the supply now permits. The demand this spring is so far from being satisfied that even gardeners are experiencing great difficulty in getting the small lots of fertilizer they need.

A wise approach to this question is to consider the amount of fertilizer needed to be used in Wisconsin to balance its soil fertility budget. In round numbers, this state has 10,000,000 acres of so-called harvested crop land or land under plow, and 3,000,000 acres of permanent pasture, about one-half of which is plowable. About 90 percent of Wisconsin's harvested crop land is devoted to the production of feed for her livestock.

In livestock farming, approximately one-half of the phosphorus and potassium removed by crops can be returned in the form of animal manure. When calculated on this basis, it is found that the annual removal of these elements by crops in Wisconsin beyond that returned in animal manure would require the annual usage of 750,000 to 1,000,000 tons of fertilizer having an average content of these elements equal to the fertilizer now used, namely, 20 percent. That a usage of this magnitude is thinkable is substantiated by a usage of 1,530,276 tons by North Carolina in 1945 on a crop acreage equal to only 60 percent of that in Wisconsin, but with more loss by leaching, much less return by manure, and an extensive acreage of tobacco needing heavy fertilization.

In addition to the annual removal of fertility elements beyond that being returned, there exists a large deficit which has accumulated over many years. In fact, large areas in the northern half of Wisconsin had relatively low supplies of available nutrients even in the virgin condition. To bring all of the crop soils of Wisconsin to the desired high level of fertility would require an initial application of at least 5,000,000 tons of high grade fertilizer.

The need for fertilizer in the other states of the Midwest with the exception of Kansas, Nebraska, and the Dakotas is undoubtedly as great as in Wisconsin. This means that a great deficit of fertility elements exists in much of the cultivated land, and that a tremendous tonnage of fertilizer is needed to bring these areas to the desired level of fertility. In addition there exists the annual drain causing an increasing deficit. Certainly the present annual usage of 2,500,000 tons in the Midwest will soon have to be doubled if agricultural production and soil conservation are to be promoted even to a mere passable degree. To do the job properly will require eventually an annual usage of at least 10,000,000 tons of fertilizer having a plant food content equal to the average of that now used. In the Midwest, excluding Kansas, Nebraska, and the Dakotas, there are 107,000,000 acres under plow, and the annual use of 10,000,000 tons on this acreage which does not include the large permanent pasture areas would provide an average annual application of slightly less than 200 pounds per acre. Higher analysis goods would, of course, decrease the tonnage needed.

Fertilizer Use Abroad

IN this connection it is of interest to note the extent of fertilizer usage in other countries. Before the war, Japan on the basis of usage per acre probably stood at the top. (See Japan, Physical, Cultural, and Regional Geography by Trewartha, 1945.) On her cultivated area of only 14,900,000 acres (Wisconsin, including permanent pasture has 13,000,000 acres) Japan used in 1934 about 2,000,000 tons of chemical fertilizer (280 pounds per acre), and

*See U.S.D.A. Misc. Pub. No. 586, 1946.

about 70,000,000 tons (nearly 5 tons per acre) of organic manures, such as animal and human excrement, soybean cake, and fish scrap. These are staggering figures, and serve to emphasize the enormous amount of plant food that has to be added when production is pushed to the limit.

Crops high in quality and nutrition now demanded by consumers, make fertilizer use imperative. Other factors include greater yield, lower labor costs per ton produced.

Fertilizer Usage and Farm Prices

HISTORICALLY, fertilizer usage in this country has gone up and down very closely with farm income. As already pointed out, this is based largely on usage in the cotton states. Will the usage of fertilizer in the Midwest follow the same pattern? That total usage will be influenced greatly by farm income, there can be no question. That it will fluctuate less in the Midwest than it has in the past in the Cotton States appears also to be a reasonable conclusion. Here are nine reasons for this conclusion:

(1) The Midwest is easily the premier agricultural area of the world with respect to a combination of the following economic factors: Of the Nation's total acreage of land suitable for agriculture without special treatment such as irrigation and drainage, the Midwest embraces 90 percent of the excellent or top grade land, and 55 percent of the good or second grade land; it has a favorable climate for the production of the principal food and feed crops; the excellence of its transportation, processing, and marketing facilities for agricultural products is unsurpassed; within its borders are located the world's greatest manufacturers of agricultural machinery and equipment; as a group, the farmers of this area have unequalled energy and productive capacity; and finally, within this area are located a large portion of the Nation's leading institutions of agricultural research and teaching.

(2) The Midwest is not a one or two crop region. Of the Nation's total, it produced in 1946 79 percent of the corn, 69 percent of the small grains, 47 percent of the hay, 61 percent of the meat, 51 percent of the eggs, and 54 percent of the milk. It also produced most of the soybeans, and a large share of the canning crops. The milk produced in Wisconsin in 1946 had a value of $526,000,000. This enormous production of the staple food crops under the very advantageous conditions should in the future give the area a much more stable farm income than has prevailed in the Cotton States.

(3) The financial position of the farmers in the Midwest is the strongest today that it has been any time since World War I.

(4) Farmers quite generally have become soil conservation minded, and in making soil conservation practices fully effective they will have to use more and more fertilizer. High acre-yields on the less erodible land through fertilization reduce the need of cultivating the more erodible land. High soil fertility increases the rate of water intake and growth of a vegetative cover, both of which tend to retard erosion.

(5) Since the main cost of producing crops is labor, and this item is the same whether the yield be high or low, it follows that high yields through adequate fertilization are the key to profitable crop production during periods of low prices. Farmers are rapidly becoming cognizant of this fact.

(6) In the future, more than in the past, high quality and nutritive value of crops as favored by fertilization will be preferred and demanded by the consumer. Moreover, a stage of plant food depletion of much of the Midwest's best soils has been reached where the regular use of fertilizer is needed to maintain both yield and quality of crops.

(7) The future development of improved fertilizers and methods of applying them will reduce farmer resistance to their use and increase their effectiveness. These developments will tend to step up and maintain fertilizer usage.

(8) In Wisconsin farmers are now spending in round numbers annually $10,000,000 for fertilizer, $2,000,000 for lime, and $75,000,000 for livestock feed raised outside of the state. Even during the years of low farm prices in the thirties, farmers were purchasing annually $15,000,000 to $20,000,000 worth of feed. Since farmers are rapidly learning that a dollar invested in fertilizer will usually produce several dollars worth of feed, and often much more, it seems reasonable to believe that in the future when fertilizer supplies will permit, Wisconsin farmers will divert a large share of their feed dollars to the purchase of fertilizer. By expending $25,000,000 more annually for lime and fertilizer, the farmers of Wisconsin could probably reduce their present annual feed bill from $75,000,000 to $25,000,000 or even less, and thus effect a saving of at least $25,000,000 and at the same time greatly promote soil conservation.

(9) Of the Nation's total, Midwest farmers produce 60 percent of the food, apply 60 percent of the agricultural lime, but use only 20% of the fertilizer. Over much of their crop land, the high native fertility has become reduced to a level which requires the use of fertilizer for the most economical crop production. Usage of fertilizer in this area, as has already occurred in the case of lime, will eventually have to approach a level much more in keeping with the food output.★★

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by

Dr. Alvin J. Cox

THE Pacific Slope Branch of the American Association of Economic Entomologists met at the Claremont Hotel, Berkeley, California, June 23, 24 and 25. Some 300 persons were registered.

Dr. E. N. Cory, president of the A.A.E.E. discussed the internal affairs of the association, stating that the membership is now about 2,000, having doubled in the past 10 years. He mentioned the importance of the national research bill before Congress, and the International Congress of Tropical Medicine to meet soon in Washington, D. C. The association now has four sections, and steps are being taken to establish in addition a section of Medical Entomology.

Dr. F. G. Hodaway, University of Hawaii, presented a paper illustrated by lanternslides, under the title of "Some Insect Problems Characteristic of Hawaii." He said that most of the economic insects of Hawaii have come to the Territory from elsewhere. He discussed a number of insect pests, some of which already occur in the U. S. proper. Others not now present are possible hazards in the U. S., he said, since they cause serious injury in Hawaii to crops which are also grown in the United States.

The *broad mite* in the U.S.A. is generally a pest only of greenhouse plants, but in Hawaii it attacks many field crops, such as beet, chard, pepper, tomato, green bean, soy bean, cowpea, eggplant, Irish potato, avocado, mango, watercress and papaya. The *privet mite* is a pest of papaya. The insect thwarts production by preventing flowering. Sulfur dust controls each of these mites. *Garden fleahopper,* which normally feeds on pigweed, can ruin plantings of carrots and beets in the drier sections as the native hosts dry. The pests attack the cotyledon leaves, which shrivel and die.

A blowfly problem, produced by three species, which have characteristics like those of screw worm and also of wool maggot, occurs in some sections. The flies oviposit on the skin of the hair of calves up to 2 weeks old. Unless found and treated, the attacked calves die. A dressing of phenothiazine, turkey-red oil and lamp black, has proved effective.

This report of the Pacific Slope Branch of the A.A.E.E. meeting is furnished by Dr. Alvin J. Cox, and appears in the place of his "Comments," a regular monthly feature in Agricultural Chemicals. Space limitations prevent complete summaries of more than a few of the 48 papers presented and of the numerous discussions held during the three day meeting. However many of the highlights are presented herewith. Dr. Cox's report of the meeting will be concluded next month.

—The Editor

The *sweet potato leafminer,* which can defoliate sweet potato vines, is controlled by a diesel oil emulsion nicotine spray. *Orchid weevil* came from the Philippines. The larva attacks orchid leaves. The adults injure the roots and flowerbuds by their feeding. Commercial orchid growers could find no method of controlling until 2 pounds DDT per 100 gallons proved effective This has practically eliminated the weevil from the orchid garden and reduced flower injury.

The *monkey pod caterpillar* reached Hawaii from the east during the war. The monkey pod is the most beautiful and most highly prized shade tree grown in the islands. The caterpillars cause defoliation by feeding on the developing leaf buds and a gall-like formation results. A water-suspension spray of 2 pounds actual DDT per 100 gallons was found to control the larvae and afford protection to the trees. The *Chinese rose beetle* reached Hawaii from the Orient, over fifty years ago. It feeds on the foliage of many economic and ornamental plants and trees. Until DDT became available, acid lead arsenate was the only material capable of controlling it and foliage injury commonly occurred even then. DDT has been found to be an efficient control, although foliage injury on certain plants can occur when it is used at concentration as high as 2% in a dust at a concentration over 2 pounds actual DDT per 100 gallons of spray.

The *melon fly* is a native of the Orient, the Phillipines and islands of the Pacific. It has been in Hawaii over half a century. It is the most serious hazard in the production of cucurbits. It also attacks tomato. DDT and one of its analogs are outstanding for melon fly control. The mango fly or Formosan citrus fly occurs from Formosa through the Orient to the Phillipines. It is undoubtedly the most devastating fruit insect ever to enter Hawaii. It may attack the same crops as the Mediterranean fruit fly. All the important fruits grown in Hawaii, with the exception of pineapple are attacked by it, or the melon fly. Control projects are being established in which parasites and predators are being utilized.

Throughout the century economic insects have been entering

Hawaii. During the war a large batch of new species arrived. This new influx includes the important mango fly or Formosan citrus fly probably from Saipan. Increased vigilance is necessary because air traffic and surface transportation have expanded to further the hazard of transporting some of these insects to the U. S.

Dr. T. C. Allen, University of Wisconsin, presented an address on the "Suppression of Insect Damage by Plant Hormones." He stated that in recent years biologists, plant physiologists, botanists and other scientists have cooperated to produce rapid developments in plant growth regulating substances. These materials produce several distinct manifestations on plants, such as modification of tissue including herbicidal action, root induction, parthenocarpy of fruit, and inhibition of abscission layers. Plant hormones will check abscission caused by *Lygus oblineatus* (Say). Evidence was also presented indicating that applications of certain insecticidal materials will cause a hormone-effect to vegetable plants. DDT 0.16% stimulated cucumbers, and twice this amount stimulates beans, Dr. Allen said.

Plant growth regulators now appear to play a roll in the expression of insect damage to plants. Insects may inject or withdraw substances with resultant tissue response. The literature indicates a relationship between insect damage and growth substance activity in plants. This suggestion is based upon (1) the similarity in growth changes in plants caused by hormones and insect feeding, (2) similarity in enzymic activity where it appears to be involved, and (3) certain bean plants when treated with hormones failed to show the expression of insect damage after insect feeding.

Dr. Allen concluded that plant growth regulating substances (1) may be a new tool in the hands of the entomologist in explaining the nature of toxin activity following insect feeding, (2) will in some instances produce growth changes in plants similar to that caused by insects, and (3) will also inhibit the development of abscission caused by lygus bugs. They appear similar where enzymic activity is involved. Also evidence was presented which indicates that DDT, particularly the para para isomer, will act as plant growth promoting substance, and it is concluded that chemicals possessing both insecticidal activity as well as properties for inducing certain growth changes in plants would be future important factors in controlling insects.

H. M. Armitage, Chief, Bureau of Entomology and Plant Quarantine, State of California Dep't of Agric. discussed the "Mexican Bean Beetle on the Pacific Coast." This pest was found near Ventura in Ventura County late in July 1946, for the first time on the Pacific Coast. The 25 acre planting of lima beans which was judged to represent the focus of the infestation was purchased by the organized bean growers, and burned and disced under to further dispersal of beetles. A survey showed infestation of properties approximating 2000 acres of lima beans lying in the near center of 40,000 acres of almost contiguous plantings, and including some of the most productive acreage in the state. A buffer area was set up around infestations. Since the bean crop nets $60,000,000 annually and the bettle is the most serious pest of beans in the eastern U. S., the infestation received the attention of State and county agricultural authorities with full grower support. Total appropriations for this work exceed $120,000 annually for the next three years.

Dr. Neal F. Howard, in charge of the Federal Laboratories at Columbus, Ohio, was sent to the coast by the Federal Bureau of Entomology and Plant Quarantine at the request of the State of California Dept. of Agric. He has had many years of experience in the control of this insect in the east. However, eradication or suppression presented a new problem. The beetle had been so long established in the eastern part of the United States that it was thought of only in terms of a control problem, which ranged to 95% effective. Frequent dusting with rotenone 0.5% at 50 pounds per acre, followed in two weeks with cryolite 50% and two weeks later with rotenone-"Lethane" completed treatment operations during 1946. This placed all infestations buffer areas, and intervening plantings under control. It was difficult to cover the mature vines because of having to reach the underside of the leaves where the insects feed. There was little if any reproduction in treated fields following dusting, however.

The 1947 program has included determination of and elimination of winter hibernating quarters wherever possible. Studies so far have eliminated suspected native plants as hosts. A trap crop grown 2 months ahead of the main crop was only partially effective. Dusting of the infested fields has been continued, along with a buffer around the periphery of the general infested area. Surveying is being extended to include adajacent counties.

THIRTEEN papers were presented at the afternoon session of June 23. Dr. A. M. Boyce, University of California Citrus Experiment Station, Riverside, discussed some of the entomolgical problems of walnuts in Southern Calif. Cryolite is effective against the walnut husk fly; DDT is effective against codling moth on walnuts but more difficult to handle than on pome fruits; hexaethyl tetraphosphate and the pyro product are both effective on walnut aphis; European red mite and spotted mite on walnuts are controlled by a "DN" product. Dr. A. E. Michelbacher, University of California, Berkeley, stated that northern problems are not the same as those in Southern California. He has been working to find an aphicide that could be incorporated in a codling moth treatment. One pound of nicotine dry concentrate on one pound of 6% gamma isomer per 100 gallons resulted in good control when used in a codling spray. Dr. W. W. Middlekauff, University of Calif., Berkeley, discussed codling moth control on walnuts. He said that with a simply spray of ½ pound of DDT per 100 gallons the

(*Turn to Page* 53)

The Listening Post

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Survey, Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller

Local Forecasting of Tomato Late Blight

DESTRUCTIVE late blight outbreaks such as last year's on tomato are infrequent. A period of rather cool daily temperatures, averaging not more than 75 degrees F., with constant moisture supplied by rains or by a humid atmosphere with heavy dews, is necessary for the development of severe attacks. Even though the disease may have gotten off to a good start, a period of unfavorable weather, i.e., too dry, or too hot, or both, will check its spread; however, if the cool "muggy" conditions should return, late blight would be ready to make a come-back.

This particular weather combination necessary for severe outbreaks is not common in areas where tomatoes are important. Summer temperatures are usually too warm, and rainfall is often too slight, to permit the disease to get a start.

Late blight thus presents a serious control problem. When conditions are just right for it, it strikes suddenly and causes heavy losses. Spraying and dusting are usually not very effective if started after the disease has spread. On the other hand, routine control measures against a disease that occurs so infrequently would cost the grower more in the long run than he would gain from preventing crop loss in late blight years.

Obviously, reliable foreknowledge is the only really effective and practicable protection against late blight. One method of supplying such advance information has been worked out for Eastern Virginia. In that area blight occurred 2 years of the past 17. Study of the records for the 2 blight years and the 15 non-blight years showed that when blight occurred it appeared about May 20, that initial development depended on weather during the preceding 2 weeks, and that destructiveness depended upon continuation of favorable conditions into June or July. On this basis it was determined that forecasting should begin the second week in May. Spraying or dusting would be recommended after there had been 2 consecutive weeks in May when both temperature and rainfall were favorable for blight. Recommendations to cease spraying would not be made until there had been 2 consecutive weeks when either or both temperature and rainfall were unfavorable. The 5-day weather forecasts for the area furnish additional indications as to probable future development.

So far this year, the forecasts indicate that control for late blight will probably not be necessary in that area. Growers are warned that they must be ready to spray as soon as a forecast indicates that blight will develop.

Adhesive Increases Effectiveness

IN experiments in New York, the addition of the adhesive "Orthol K" to "Zerlate" increased the control of tomato late blight as expressed in substantially greater yield and in lower percentage of infected fruit. The use of "Omilite" with "Zerlate" did not have the same effect, and neither of the two stickers produced any marked effect when mixed with

(*Turn to Page* 52)

Insect Conditions in Late May and Early June

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Haeussler is in charge of Insect Pest Survey and Information, Agric. Research Adm., B. E. & P. Q., U.S.D.A. His observations are based on latest reports from collaborators in the department's country-wide pest surveys.

By G. J. Haeussler

REPORTS concerning the status of various cotton insects began to become available toward the end of May. These indicated that development of the cotton crop in general was from two to three weeks later than normal due to unfavorable weather conditions which also retarded emergence of boll weevils from their winter quarters. Although early reports indicated an apparent light carry-over of weevils in many areas, by the middle of June they had become abundant in the cotton fields of North and South Carolina, Georgia, Alabama, Mississippi, and Louisiana. Serious losses on thousands of farms in those states are in prospect unless weevils are checked by hot, dry weather, or by the proper use of insecticides. In South Carolina the situation is especially serious. A news release issued on June 16 by the Extension Service of Clemson College indicated that reports from county agents who examined 167 fields in 35 counties showed an average of 679 weevils per acre and 14.1 percent punctured squares. Of the fields examined, 143 were infested, the num-

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Extensive tests on RHOTHANE, the Rohm & Haas analog of DDT, convincingly proved that this insecticide concentrate is effective against all insects controlled by DDT. More recently, it has been demonstrated that in some instances RHOTHANE is definitely *superior* in insecticidal action. For example, Experiment Station tests in New Jersey in 1946 showed that RHOTHANE gave substantially better control of corn earworms than any other insecticide tested, *including* DDT at the same concentration.

two- Highest yields from tomato acreages

Comparative studies of the effectiveness of various insecticides in controlling pests attacking tomatoes were conducted as part of a research program carried out last summer in California. The highest yields were obtained with a 5% RHOTHANE treatment . . . approximately 24.74 tons per acre. This compared with a yield of 21.96 tons with 3% DDT and 21.06 tons with 5% DDT.

three! Greater safety when used on cauliflower, cabbage

Another advantage of RHOTHANE over DDT is to be found in its substantially lower toxicity to warm-blooded animals. This feature is particularly important when used for the control of pests on cauliflower, cabbages and other leafy vegetables.

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ber of weevils ranging from 150 to 3,000 per care, and the percentage of punctured squares to as high as 72.

Infestations of the cotton fleahopper were on the increase in many counties of central and southern Texas by the middle of June. In the coastal areas of the state, where many fields had high infestations, dusting with 5 percent DDT-sulfur was general and excellent control was reported in the Port Lavaca-Victoria area.

By mid-June, the bollworm, aphids, and thrips had been reported from cotton fields in most areas, but no reports of cotton leafworm had been received despite intensive surveys. A report for the week ended June 14 indicated that much poisoning was being carried on in many counties in central Texas, especially in the Brazos, Colorado, and Trinity River bottoms, to prevent damage to cotton, pastures, and hay crops from large numbers of grasshoppers.

With regard to the insects affecting truck and garden crops, infestations of the Mexican bean beetle have increased to the point that by the middle of June this pest was causing moderate to heavy damage to beans in most of the southern states and in Tennessee and Ohio. Infestations were reported as light to moderate in New Jersey and Mississippi. In California, the first Mexican bean beetle of the season was found in the field on May 13 at Montalvo, Ventura County.

Heavy infestations of the bean leaf beetle occurred in many of the southern states during the latter part of May, with light infestations reported as far north as Ohio. In most areas populations had declined by the middle of June.

Severe infestations of cabbage caterpillars on cabbage and related crops occurred during the last half of May and the first two weeks of June in parts of many of the southern states. Heavy infestations were also reported toward the end of May in central Washington and in Texas. In New Jersey, Virginia, Georgia, northwestern Tennessee, and Utah infestations of these pests were light during the first half of June.

The cabbage leaf beetle, which was first discovered this year in the vicinity of Mobile, Alabama, was found during the second week of June in additional localities in Mobile County and also in the Ellisville community, located about 2½ miles west of Loxley, in adjacent Baldwin County.

Reports of serious injury by the cabbage maggot to cabbage and cruciferous crops were received during recent weeks from central Washington, New Jersey, and Ohio. The maggot was also reported as causing some damage in New York and Wisconsin.

Activity by the Colorado potato beetle increased during the past few weeks. In the first half of June this insect was reported causing serious injury to potato, and to a lesser extent, tomato and eggplant in New York, New Jersey, Georgia, Tennessee, Ohio, Texas, and central Washington.

In early June the tomato hornworm was abundant on tomato in Alabama, Texas, and Utah. A serious infestation of blister beetles also occurred at that time on tomato, potato, and pepper in Georgia.

Toward the middle of June the potato leafhopper was infesting potatoes seriously in Mississippi and to a lesser extent in Tennessee.

Pea weevil infestations during the first half of June were reported as heavy in southern Idaho and light to moderate in northern Utah and in the Palouse district of Idaho—Washington.

Aphids have been present in various degrees of abundance on a wide variety of vegetable and truck crops during the last half of May and first half of June. The pea aphid was present about the middle of May in most pea fields throughout the Blue Mountain district of Washington and Oregon, but not in sufficient numbers to cause much danger to the crop. However, a period of drought toward the end of the month hastened the production of winged forms which moved to later maturing fields at higher elevations. By the first week of June the aphid was present in pea fields at all altitudes up to 4,000 feet. By the middle of the month pea aphid populations showed general increases in the mid-season and late-season pea fields of the district, especially at the high elevations, and insecticides were being applied to many of these fields. Heavy rains aided somewhat in reducing aphid numbers in certain localities. Pea aphid infestations have not been reported as particularly serious in other parts of the country, although insecticide applications were made in late May to control this pest in New Jersey, on the Eastern Shore of Maryland and Virginia, and in the Yakima Valley of Washington. By the middle of June, populations of the aphid were on the decline or were very light in the eastern states, in Tennessee, and in Wisconsin, Minnesota, and Idaho.

About the middle of May an unprecedented outbreak of the green peach aphid was reported on sun-grown and shade-grown tobacco in a number of counties in northern Florida and southern Georgia. The outbreak continued during the first half of June, despite control efforts which included the use of nicotine dusts and sprays, a 5 percent chlordane dust, benzene hexachloride, DDT dusts, and a number of other materials used as sprays or dusts. Reports received toward the middle of June indicated that aphid outbreaks were also occurring on cigar types of tobacco in the Connecticut Valley.

The hop aphid was migrating from prune trees to hops in central Washington and the Salem district of Oregon during the last half of May and early June. The hop thrips has also been reported as abundant in some hop yards of central Washington.

No serious outbreaks of fruit insects were reported during the period extending from the middle of May to the middle of June. Toward the end of the period codling moth activity was fairly heavy in most areas reporting, with entrances of first brood larvae in fruit being on the increase in New York, Maryland, southern Indiana, and Kentucky.

A full second brood of the plum curculio is anticipated this year in the Fort Valley area of Georgia. Activity by this insect was reported

as heavier than usual in the Ulster County area of New York in early June and the curculio caused serious injury in some apple orchards in the vicinity of Hancock, Maryland.

The European red mite and the two-spotted spider mite were increasing rapidly in numbers in the Vincennes area of southern Indiana toward the middle of June. There were indications that these mites may reach destructive populations in some orchards in that area by early July.

TOMATO BLIGHT

(*Continued from Page 49*)

"Fermate." Although "Orthol K" plus "Zerlate" was not as effective as Bordeaux mixture against late blight, the increased efficiency of the mixture over "Zerlate" alone may enhance its value against other tomato diseases, such as early blight, Septoria blight, and anthracnose.

Control With Copper Spray

IN a tomato crop grown on the Plant Industry Station, at Beltsville, Md., primarily for the purpose of determining the effect of various DDT treatments on plant growth and fruit yield, only one plot received a fungicide spray. This was Tennessee Tri-basic copper used at the rate of 4 pounds in combination with 0.6 pounds of technical wettable DDT per 100 gallons of water, in 8 applications beginning the middle of June, the last in mid-August 6 days after the first picking. By the time of the fourth picking at the end of August, plants receiving no fungicide were seriously blighted, while those sprayed with tri-basic copper were relatively healthy. To determine the effectiveness of tri-basic copper in the protection of tomato fruits from late blight, a lot from the tri-basic copper treatment was compared with a lot that had received cryolite and sulfur. These fruits were stored at 60° F. for 9 days and examined for late blight with the following results: from the tri-basic copper treatment, 410 fruits in the test developed 1.5 percent late blight; from the cryolite and sulfur treatment, 305 fruits in the test developed 53.4 percent late blight.

In experimental plots at two places in New York, where a number of different fungicides were being tested against various tomato diseases, damage from the tomato hornworm was noticeably less in plots sprayed with fungicides than in the unsprayed check plots. All of the treatments used reduced the amount of damage below that in non-sprayed plots, but "Zerlate," copper materials, and "Dithane (D-14)" with zinc sulfate and lime, were most effective. The treatments used (not all at both places) included "COCS" (56%); copper hydrate (73%); Copper Compound A; Tennessee Tribasic Copper; "Microgel"; Bordeaux mixture; 5-application alternating schedules of "Zerlate" and Bordeaux, of "Zerlate" and "Tennessee Tribasic," and of "Zerlate" and "Microgel"; "Zerlate"; "Fermate"; "Phygon" in two strengths; "Dithane (D-14)" plus zinc sulfate and lime; and "He 178e."

AAEE MEETING

(*Continued from Page 48*)

infestation was never greater than 0.9%, while it was frequently 10% or more on unsprayed trees.

L. G. Gentner, Southern Oregon Experiment Station, Medford, discussed "Aerosol Generator Applications of DDT for Codling Moth Control." Fog machines do not afford a uniform deposit when the pear trees are large. Wettable DDT powder, lead arsenate and cryolite settled. The deposit was not uniform and it was twice as heavy close to the nozzle. DDT dissolved in kerosene gave a suitable fog. There was only ½% worm-injury to fruit when DDT was used as compared with 6.2% for cryolite. By using the aerosol generator there was a 59% saving over the regular wet method.

Prof. Victor K. La Mer, Columbia University, N. Y., discussed, "The Hochberg-La Mer Insecticidal Aerosol Generator." He said that wind drift up to several miles per hour has no effect on particle size. A slit is not a good opening, but best results are obtained with capillary length five times the diameter of opening.

Dr. M. W. Barnes, Univ. of California Citrus Experiment Station, Riverside, presented, "Deciduous Fruit Insect Control Investigations in Southern Calif." Spectacular results were obtained with DDT against grape leafhopper and codling moth. The high effectiveness of several new insecticides for wooly apple aphis control was reported. Dr. S. C. Jones, Entomology Department, Oregon State College, Corvallis, reported that formerly lime-sulfur solution was depended upon for control of pear thrips on prunes in Oregon, but the advent of DDT has changed the program. He has tried many new products and DDT gave the best results. It was used both as a dust and a spray.

A. D. Borden, Dewey Raski and Harold Madsen reported that destruction of natural enemies of mealybug has caused build-up on pears. Pear bud mite is controlled by the standard practice of lime sulfur and wettable sulfur after the crop is off.

Dr. D. D. Jensen, University of Calif., Berkeley, presented a paper, "Aphid Transmission of Papaya Ringspot in Hawaii." This virus disease, origin of which is not known, occurs on the Island of Oahu. The disease manifests itself by yellow rings on the unripe, green-colored fruit. Ringspot virus does not kill the tree but weakens it and makes it susceptible to other pests. Insects are probably the major means of spreading virus diseases of plants.

Dr. E. S. Sylvester, Univ. of Calif., Berkeley, read a paper on the effect of multiple feeding punctures on virus transmission. Nine infections occurred out of 25 possibilities by regular feeding for 10 hours. When the feeding was interrupted so that a new puncture was made each hour, the nine was increased to 17.

Dr. R. N. Jefferson, University of Calif., Los Angeles, presented

a paper entitled, "Preliminary Experiments with Chlordane and Benzene Hexachloride to Control the Aster Leaf-miner." A 4.7% nicotine dust will hold down the aster leaf miner, but is not a good control. Both insecticides named in the title proved very promising. White fly was present in all plots except where benzene hexachloride was used. Spray may be used up to picking time, dust must be stopped 10 days earlier.

J. H. Freitag, University of California, Berkeley, reported on 3 leafhoppers and 11 other species reported as insect vectors of Pierce's disease virus. The host range is indicated by finding involved species on Joshua trees in the desert. Seventeen species of 29 tested were infected, but only 3 are of economic importance in spread of this disease.

THE morning session on June 24 was devoted to a symposium on the "Relation of Chemical Control to Beneficial Insects," under the leadership of Prof. Harry S. Smith, Division of Biological Control, University of California Agricultural Experiment Station, Riverside and Berkeley. Chairman Dr. M. A. Stewart introduced the subject stating that insecticides up to this time have insufficient selectivity, so that they are too often lethal to beneficial as well as to injurious insects. It is possible for a product to be too efficient as an insecticide. It has become evident that materials such as DDT cannot be used indiscriminately.

New insecticides make entomologists conscious of the effects of the products on biological control. A recognition of the importance of the problem will, it is hoped, result in research on the dynamics of insect population. Lack of such research will bring conflicting opinions with little real knowledge.

R. S. Woglum and associates, California Fruit Growers Exchange, Los Angeles, presented "Observations on the Effects of Commercially Applied Insecticides on Beneficial Insects of Citrus Trees." He divided citrus practice of the last 40 years into three periods of (1) Intermittent fumigation (2) Use of white oil sprays, and (3) Newer synthetic insecticides. In the early period when little insecticide was used, citrus pests were held in check by biological control, he said. However, with the large use of insecticides and the improvement and greater power of applicators, the effectiveness of biological control was much reduced.

Dr. Ray F. Smith spoke on "The Relation of Alfalfa Insect Control Programs to Beneficial Insects." The Alfalfa butterfly is the most serious pest. It is easily controlled by 50 to 60 pounds dusting sulfur per acre or by DDT dust; however the parasites are also susceptible. In some cases 3 dustings in 2 cuttings are necessary. Supervised control is planned to take advantage of the parasite and not to develop further problems by its extermination. The work so far has benefitted the parasite-butterfly relationship.

(Another installment next month will discuss the remaining papers including the symposium on "New Insecticides").

Suppliers' Bulletins

Cattle-Spray Folder

The Kansas City branch of Sherwin-Williams Co., has recently issued a pamphlet on cattle spray with DDT wettable powder, or DDT non-oil stabilized emulsion. The folder gives directions for use on animals and in barns against hornflies, lice and mosquitos. Information is also given on the DDT products manufactured by Sherwin-Williams Co.

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2,4-D Pictured in Booklet

E. I. duPont de Nemours & Co., Wilmington, have issue a picture story of uses of 2,4-D in the June, 1947 issue of *Agricultural Comment*, published by the company. The two page spread shows various applications of the material . . . along roadsides, in drainage ditches and irrigation canals, large commercial sod areas, in row crops, on fence rows, and on pastures and ranges. Several types of application equipment are also shown in the photos. The folder also discusses the corn borer and codling moth.

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Bagging Brochure Offered

St. Regis Paper Co., New York, has published another brochure in its series of "Case Histories" reporting the use of packaging and bagging systems. The latest, No. 15, pictures the manner in which the system was used by a chemical company in expediting this portion of its business.

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United Co-op Yearbook

United Cooperatives, Inc., Alliance, Ohio, has issued its 1947 yearbook which it explains is "A comprehensive explanation of United Co-operatives' place in the agricultural cooperative field of service to farmer patrons throughout the United States." The book contains the report of the general manager, lists the member organizations and directors, and presents photos of facilities and personnel of the various departments and programs. The insecticide department, under the managership of R. Wayne Mills, is described as distributing "A complete line of agricultural insecticides and fungicides, such as lead arsenate, lime-sulfur solutions, copper sulfate, nicotine sulfate, spray lime, rotenone dusts and DDT products."

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New Herbicide by Baker

J. T. Baker Chemical Co., Phillipsburg, N. J. announces limited production of "Isopropyl-N-Phenyl Carbamate," herbicidal material for the control of quack grass. Early reports state that the new material is selective in action, and that many broadleafed plants show no sign of injury following application. Laboratory testing samples and further information are available to manufacturers of weed killers.

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2,4-D Bulletin Available

John Powell & Co., Inc., New York, has recently issued a technical bulletin on 2,4-D covering the uses and applications of 2,4-D formulations. The advantages of selective weed killer materials are listed, telling where 2,4-D may be used, describing its action, and presenting the conditions under which the material does its best work. (These include factors of temperature, rainfall, soil condition and fertility, plant growth, and the kind of plant.)

Precautions to be observed in the use of 2,4-D are noted, among which are warnings not to use excessive spray, to avoid application on windy days, not to apply the material during dry periods when plants are not growing actively, and to clean spraying equipment thoroughly after each application. The bulletin then gives lists of weeds controlled by 2,4-D, classifying them in divisions of annual and winter annual weeds, perennial and biennial weeds, and woody plants. Under each division plants are grouped as susceptible, intermediate, and resistant to the ma- and botanical names of the plants are given. The bulletin may be obtained from the company's offices, 1 Park Ave., New York 16.

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Castor Bean Booklet

Oklahoma Agricultural Experiment Station, Stillwater, Okla., has recently issued technical bulletin No. T-27 "Yield and Chemical Composition of Oil from Castor Beans grown in Oklahoma." Authors are J. E. Webster, H. Fellows, and H. F. Murphy. The booklet lists materials and methods used in various analyses of the bean, the results, and comparative tables covering the yield and chemical composition of the bean oil.

•

Spraying Brochure Offered

National Sprayer and Duster Association, Board of Trade Building, Chicago 4, has recently issued a four page brochure under the title of "Kill 'em Off," carrying pictures and written descriptions of spray materials and application equipment. The association says additional copies are available for the asking.

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Carbide & Carbon Booklet

Carbide and Carbon Chemicals has recently published a new booklet, "Carbowax Compounds and Polyethylene Glycols," giving the properties, specifications and uses of a group of polyethylene glycol compounds ranging in molecular weight up to 6,000. Fatty acid esters of the polyethylene glycols are used in insecticide emulsions and in other ways as detergents and emulsifying and dispersing agents. Copies of the booklet, form 4772, may be obtained from the company's offices, 30 E. 42nd St., New York 17.

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'Neutronyx Series' Described

Onyx Oil & Chemical Co., Jersey City, N. J., has issued technical data sheets on the "Neutronyx Series," describing the uses and characteristics of the series which comprises a group of non-ionic surface-active agents possessing emulsifying, detergent, foaming and dispersing characteristics.

Offers Laboratory Evaporator

Precision Scientific Co., Chicago, has announced a new laboratory evaporator for use in bridging the gap between pilot plant and small laboratory apparatus. The evaporator is constructed on the same general principle as large industrial units, and according to the company, eliminates the steam cone and round bottom flask as basic equipment; all parts of the evaporator are made of Pyrex glass, or 18.8 stainless steel. The glass evaporator body is made in one piece, and the steam chest will stand pressures up to 150 P.S.I. Weight of the entire unit is fifty pounds. Further information may be obtained from the company, 3737 Cortland St., Chicago 47, Ill.

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New Jersey Booklets

Recent publications by the New Jersey Agricultural Experiment Station, New Brunswick, N. J., include a booklet on mosquito control, blossom weevil control, and fertilizer and lime recommendations for New Jersey. The first booklet, entitled "The Story of the Mosquito" relates the history of New Jersey's attempts to control the insect, a life history of the mosquito, and a chart showing identifying characteristics of three genera of mosquito: Anopheles, Aedes and Culex. Succeeding pages are devoted to methods of control, and to picturing breeding places commonly found in communities. This booklet is numbered #502.

The booklet, #504, covering blossom weevil on blueberries shows photographs of the pest, pictures the larva and other stages of development and gives instructions for controlling the insect. The dosage recommended consists of concentrated lime sulfur, 10 gallons; arsenate of lead, 6 pounds; and water, 90 gallons. This spray is to be applied after the weevils appear until early leaf buds have opened. Rate of application is given as about 150 gallons per acre, where bushes are large, and a lesser amount when bushes are small.

"Fertilizer and Lime Recommendations" presents information concerning fertilizers for field crops, fruit crops and vegetables, and miscellaneous materials such as stable manure, poultry manure and sewage sludge. Instructions are given for applying lime, fertilizers, and supplemental nitrogen to fruits and vegetables. This circular is numbered #503.

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BHC Price Reduced

Westvaco Chlorine Products Corp., New York, has announced a reduction in the price of benzene hexachloride, technical grade. The new price is 47½¢ per pound, F.O.B. South Charleston, W. Va. The former price was 52½¢. The company started large scale production of benzene hexachloride early in 1947, and is now delivering carload quantities of technical grade of the material, as well as 50 percent dry and wettable dust concentrates.

Technical Briefs

Nematodes in Nevada

Use of "D-D" soil fumigant in the potato area of western Nevada which has been threatened by an invasion of root-knot nematode, has resulted in an increase of No. 1 tubers. A report of tests on a farm at Smith Valley showed the difference between production on treated and untreated soil. Fumigated area produced 25,507 pounds of potatoes per acre compared to 1,444 pounds per acre on untreated ground. The increase was said to be worth $500 in value, and the cost of fumigation was reported to be $40. On another Nevada farm, fields receiving fertilizer at different rates, but all fumigated for nemadotes, produced from 52 to 67 percent of No. 1 potatoes while two untreated fields yielded 15 percent and 44 percent of No. 1's.

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Jap Beetle Control

Results obtained in a study of DDT in controlling the Japanese beetle are summarized in U.S.D.A. bulletin E-724. In general it was found that the effectiveness of the treatment was dependent more upon the amount of DDT applied than upon the exact form in which it was applied (i.e., dust, DDT solution, emulsion or water-dispersible DDT)

It was reported the sprays and dusts killed many of the beetles hit during the application, and the residue on the plants afforded protection against beetles which came later. "DDT does not seem to be a strong repellent, since the residue did not prevent beetles from alighting on the sprayed or dusted plants," the report states. "However," it continues, "the beetles that walked over or started to feed on these plants soon became paralyzed and died."

DDT was used under varied conditions to protect different crops and ornamentals from injury by the adult beetles. Tests were conducted on apple, nectarine, peach, plum, grape, blueberry, and on a number of ornamental trees and shrubs.

As to the effect of DDT on plants, the report states that there have been very few cases where spraying the foliage with DDT at the rate of 1 pound per 100 gallons of water has caused any direct damage to the plants. The report then presents a list of deciduous fruits sprayed, the ornamentals, and the flowering garden plants.

Investigating also the effect of DDT in the soil, preliminary tests were made to determine whether various plants could be grown satisfactorily in soil containing 25 pounds of DDT per acre, or 27 grams per cubic yard. The plants were grown in treated soil and compared with those in untreated soil. The names of plants not noticeably affected includes an imposing list of vegetables, cereals, grasses and ornamentals. The plants definitely retarded by DDT in the soil were yellow onion, soybean, common tomato, lima bean, bush bean and spinach in the vegetable group, and among the ornamentals were goldentuft alyssum, strawberry, gaillardia, lobelia and scabious.

"There is some evidence that the detrimental effect of technical DDT in the soil on some plants is not caused by the compound, but by impurities and certain isomers in the technical material," the report states.

The effect of DDT on warm-blooded animals was observed in the killing of some birds, principally robins and catbirds, probably by feeding on poisoned insects. Where DDT had been applied to the ground as dust, domestic animals were excluded from the area until rain had removed most of the dust from foliage. No harm to stock was observed when this procedure was followed.

Reporting the amounts of residue found on various food crops, the bulletin stated that fruit picked immediately after being sprayed had a residue of more than 7 mg. per kilogram. Apples picked 6 days later, and passed through a wiper, had a residue of nearly 7 mg. per kilo., and apples picked 2 weeks after, and wiped in the same manner, had a residue somewhat below this. Peaches picked 2 weeks after spraying and passed through a "defuzzer" had a residue less than 7 mg. per kilo. But when more than one application of this spray was made to peaches and grapes during the summer, the residue on the fruit at harvest was definitely above the mark of 7 mg. per kilogram.

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Chlordane vs Grasshoppers

The Bureau of Entomology and Plant Quarantine, U.S.D.A., has issued a bulletin, E-722, describing the action of Chlordane in controlling an invasion of grasshoppers in Oregon. The bulletin stated that chlordane was the most effective material used in this test, made under varying conditions in the field. One-half to one pound of Chlordane per acre, applied either as dust or spray, gave 90 to 100 percent kill, and its residue remained from 3 to 4 weeks to afford control for an extended time. The variation in residual efficacy was caused by differences in acre dosage, and crop and weather conditions.

According to the USDA release, honeybees found actively grazing on Chlordane-treated alfalfa showed no ill effects during the subsequent two months of observation. (Other reports have indicated Chlordane less harmful than DDT to fish, birds, and other wildlife.)

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DDT in Apple Maggot Control

Dr. R. W. Dean of the New York Experiment Station, Geneva, has found DDT effective against the apple maggot, either as a dust or a spray, according to a bulletin issued in June. Dr. Dean added that applications must be made often enough to insure the presence of the insecticide on the trees while the adult flies are active. Unlike its residual action on walls of houses or barns, the effect of DDT does not persist so long on an apple tree, he points out. DDT is less

persistent than lead arsenate but kills apple maggot flies more quickly. The killing effects of DDT last from 10 to 14 days on the apple tree, it was found.

Based on three years' experiments in commercial orchards, two pounds of a 50 percent wettable DDT spray powder in 100 gallons of water or a 5 percent dust gave satisfactory control of both the apple maggot and codling moth. In orchards where migrations of apple maggot flies are not a problem and when late fly emergence does not occur, applications in the second, third, and fourth cover sprays will be sufficient.

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"ANTU" Rulings Changed

Two recent official Government rulings affecting the distribution of "ANTU" (alpha-napthyl-thiourea) are expected to result in wider public use of the rodenticide. The rulings, one by the U. S. Department of Agriculture and the other by the Post Office Department, will facilitate distribution. The Bureau of Animal Industry, division of Meat Inspection, U.S.D.A., now permits the use of ANTU insecticides throughout meat-packing plants to kill Norway rats, the only species of rat found in such plants except in a few spots in the southern states.

The other ruling, by the Post Office Department, modifies regulations prohibiting the shipment of rodenticides through the mails. Except for certain minor provisions, ANTU-based rodenticides may now be transported by parcel post. This is expected to help the distribution of the material in rural areas not reached economically by railway express or motor carriers.

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Md. Agri. Society Reports

A book containing proceedings of the Thirtieth Annual Meeting of the Maryland Agricultural Society, Maryland Farm Bureau, Inc., and affiliated associations has been published by the Society.

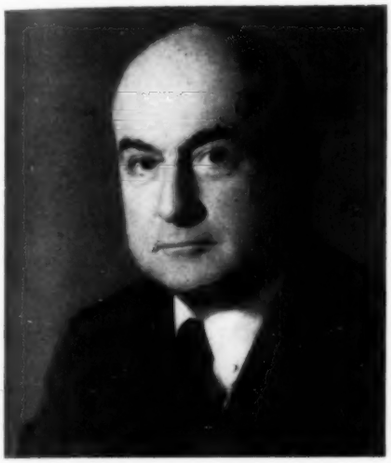
Summaries of control experiments are contained in the horticultural section of the book. These include a report by W. S. Hough of the Winchester Research Laboratory of the Virginia Agricultural Experiment station, describing DDT in Codling Moth control; another by Dr. C. Grahan, of the University of Maryland, covering the same subject with the addition of hibernating codling moth larvae. Henry W. Miller, Jr. of Consolidated Orchard Co., Inc., Paw Paw, W. Va., tells of spraying 800 acres with DDT for control of codling moth, and a discussion by Harvey B. Raffensperger, fruit grower of Arendtsville, Pa., on the subject of "Phenothiazine or DDT?"

In the stockmen's section further information on the use of DDT on animals is found. R. R. Fouracre of E. I. duPont de Nemours & Co. discusses the subject, and Dr. E. N. Cory of College Park, Md., reports the "Uses and Limitations of DDT for Cattle." The book covers many other phases of agricultural problems.

INDUSTRY NEWS

J. B. Cary to New Position

Joseph B. Cary was elected executive vice-president of Food Machinery Corporation at a meeting of the board of directors at San Jose,



JOSEPH B. CARY

Calif., on June 13. Mr. Cary was formerly vice-president and director of the corporation, and president of the firm's Niagara Chemical Division. He is also a past president of the Agricultural Insecticide and Fungicide Association. Mr. Cary will assume his new duties at San Jose, California, on August 1.

In the same election in which Mr. Cary was made executive vice-president, Ernest Hart, formerly vice-president and sales manager of the Niagara Chemical division, was made manager of the Niagara operation and a vice-president of the parent organization. All other incumbent officers of the corporation were re-elected to their former positions. The office of executive vice-president held by Mr. Cary was created to meet increased responsibilities in handling an increased volume of business, according to Paul L. Davies, president of the corporation.

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N.S.D.A. Names Hudson

R. C. Hudson, H. D. Hudson Mfg. Co., Chicago, was elected president of the National Sprayer and Duster Association on June 20 at the group's annual meeting. Harold F. Brandt, Dobbins Mfg. Co., Elkhart, Ind., was named vice-president. Other officers elected included the following: R. D. Lewis, treasurer; Frank J. Zinc, counsel; and John F. Benham, secretary. All are from Chicago. Retiring president is G. H. Collier of Elkhart.

In addition to the above officers, members of the executive board were also named. They are: Ralph H. Chapin, R. E. Chapin Mfg. Works, Batavia, N. Y.; T. M. Burton, D. B. Smith & Co., Utica, N. Y.; C. D. Leiter, F. E. Myers & Bro, Co., Ashland, Ohio; S. H. Samuels, Standard Container Corp., Montclair, N. J.; and V. A. Snell, Lowell Mfg. Co., Chicago.

At the meeting the member manufacturers reported an increasing demand for hand dusters and small hand and power sprayers.

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AIFA in September Meeting

The Agricultural Insecticide & Fungicide Association plans to hold its annual Fall meeting September 2, 3, and 4 at Spring Lake, N. J., according to Lea S. Hitchner, executive secretary of the association. Preliminary plans call for a number of outstanding features on the program, details of which will be announced later.

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New Sales Manager

Joseph J. Duffy, Jr. has been named sales manager of the Special Chemicals Division of Pennsylvania Salt Mfg. Co., Philadelphia.

Senate Passes New Insecticide Act

THE new federal insecticide act, (H.R. 1237) designed to supersede the outmoded act of 1910, was passed by the U. S. Senate June 16. The bill was signed by President Truman on June 26 and some sections of the act became law at once, other sections will not become effective for varying periods.

Content of the law, known as the "Federal Insecticide, Fungicide, and Rodenticide Act," is essentially the same as the original text which appeared in the February, 1947 issue of AGRICULTURAL CHEMICALS. According to releases received immediately following the passage of the bill, no amendments of importance have been added, and the law stands as the best possible combination of the collective thought of Federal-State Governments, and other interested groups.

H.R. 1237 was a half year in the process of becoming law. The bill was introduced into Congress on January 23, 1947, by Rep. August H. Andresen of Minnesota. Hearings on the bill began on April 11, before a subcommittee of the House Agriculture Committee. At this time, certain amendments were suggested, and discussion was held regarding the inclusion of advertising under the labeling requirements of the bill, and on the subject of registration of products.

On May 12, the bill was approved by the House, and sent to the Senate where a committee was assigned to hearings, and a favorable report given. Five weeks later, the act was passed by the Senate.

The law itself represents more than two years of conferences and revisions among industry, agriculture and government personnel.

All sections of the Act do not become effective at the same time. The section covering devices came into effect on June 26, 1947, but the part covering herbicides and rodenticides will not be effective before December 26, 1947. Insecticides, fungicides, and other parts of the Act must wait a year, (June 26, 1948) before being effective.

World Nitrogen Supply Short

The International Emergency Food Council announces a shortage of 800,000 tons of nitrogen in meeting the requirements of more than 100 claimant countries or areas for the 1947-48 fertilizer year. The situation results not so much from lack of production, the I.E.F.C. reports, but because of increased needs, now "much greater than prewar since soil fertility lost during the war years must be restored and larger populations must be fed." Only five countries produce more nitrogen than is needed for their own agriculture. These five are Canada, Chile, United Kingdom, Belgium and Norway. The United States, the report says, "is a net importer, but owing to the nature of world trade usually exports some nitrogen and plans to export 52,600 metric tons in 1947-48."

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Plane Demonstration August

Use of the airplane for crop protection and other agricultural purposes will be discussed and demonstrated at a three day conference, first of its kind, to be held August 7-9 at Stillwater, Oklahoma. The event, sponsored by Oklahoma A & M College, will cover subjects such as new pest control materials, use of airplanes for dust, spray, and aerosol applications, and use of helicopters for similar purposes. Commercial operators from the south and southwest will make demonstrations of methods used in applying insecticides, fungicides, weed killers, seeds and fertilizers. Planes and other equipment will be available for inspection. Dr. F. A. Fenton, professor and head of the entomology department at Oklahoma A & M is conference chairman.

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W. D. Luhrs Dies

William D. Luhrs, retired former manager of the Boston branch of Innis, Speiden & Co., New York, died at Brighton, Mass., May 22. He had been manager of the branch since 1918, retiring late in 1944. James O'Connell, Jr. was appointed to succeed Mr. Luhrs.

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Shade Conference in August

The National Shade Tree Conference will hold its 23rd annual convention in Cleveland, Ohio, August 18 to 22, according to Charles F. Irish, National Conference president. Mist spraying of trees and spraying materials will be discussed, as well as specialized applications of such. Field demonstrations and commercial exhibits are scheduled to be shown during the four-day meeting.

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Hyman Opens Western Office

Julius Hyman & Co., Denver, Colo., has announced the opening of its Western sales office at 9 Main St., San Francisco, Calif. The new unit has been established to facilitate sales and technical service to customers and exporters on the west coast. The firm makes "Octa-Klor" brand of chlordane. In charge of the western office is Edward Degginger, formerly of Chicago.

The Hyman Co. also announces the appointment of Howard Rosenbaum as technical sales representative.

Handling & Storing Ammonium Nitrate

THE U. S. Department of Agriculture recently issued a bulletin (No. 719) regarding the safe handling and storage of ammonium nitrate. The June, 1947 issue of the *Horn Blower,* published by the California Fertilizer Association presented the following summary of these instructions, as follows:

"Ammonium nitrate, untreated or treated, should be stored in a dry location, preferably fireproof, but, in any event, away from combustible material.

"Laminated, waterproofed paper or fabric bags may be used for packaging these materials, and filled bags should be stacked to allow ample ventilation.

"Combustible materials or easily oxidized metals, especially copper if finely divided, should be stored at a distance, in order to prevent accidental mixing with ammonium nitrate.

"Mixtures containing acid salts or free acid, ammonium nitrate, and organic material should not be stored unless neutralized with ammonia.

"Ammonium nitrate may be stored in bulk, only in a form definitely known not to cake in the time it will be stored. Bulk storage often results in severe caking, which makes it difficult to handle without blasting.

"Caked ammonium nitrate should never be broken up by blasting with explosives.

"Commercial fertilizer mixtures containing ammonium nitrate require no special precautions regarding explosions and may be handled in the same way as similar mixtures containing sodium nitrate. It requires the presence of more than 50 percent of ammonium nitrate with ammonium sulfate to make the mixture explosible under violent shock-test conditions.

"Bags that have contained ammonium nitrate should not be piled even temporarily in or near a wooden building, as they are inflammable. Bags should be burned promptly after emptying.

"Bearing in mind that ammonium nitrate is explosive and supports combustion, it should be handled in such a way as to avoid conditions that would make it dangerous. More than ordinary caution should be practiced along the lines indicated, but no violent reactions need be anticipated from impacts, jars, or friction, which must be avoided with more sensitive explosives.

"Should ammonium nitrate be involved in a burning building or in a fire with other combustible material, ordinary fire-fighting methods should be used to extinguish it. Water is generally the most convenient and effective; it will exert its usual cooling effect in extinguishing a fire.

"Fumes from burning ammonium nitrate are extremely toxic and should not be inhaled. Persons who fight fires in which these chemicals are concerned should wear gas masks.

"Mixtures containing superphosphate, organic conditioner, and ammonium nitrate may ignite spontaneously in storage if the temperature reaches 90° C. (194° F.); neutralization by ammonia eliminates this possibility."

Coming Meeting

Agricultural Chemicals wishes to publish the meeting date and place of any gathering concerned with manufacturing, distribution, application or discussion of chemicals for agricultural use. Information of such meetings is solicited.

International Congress of Pure and Applied Chemistry, London, July 17 to 24.

National Farm Safety Week, July 20-26.

Conference of Southwest Plane Sprayers, Stillwater, Oklahoma, August 7-9.

23rd Annual meeting, National Shade Tree Conference, Cleveland, Ohio, August 18-22.

Agricultural Insecticide & Fungicide Association, Fall meeting, Spring Lake, N. J., September 2, 3, 4.

Fertilizer Chemistry Division, A.C.S., Sept. 14, New York.

15th Annual Convention National Pest Control Association, Bellevue-Stratford Hotel, Philadelphia, October 27, 28, 29.

Pacific Chemical Exposition October 21-25, San Francisco.

American Association of Economic Entomologists (In conjunction with meeting of American Association for Advancement of Science, December 26-31, Congress Hotel, Chicago, Ill.

Exposition of Chemical Industries New York, December, 1947.

Stockholm Meeting for 1948

Announcement has been made of the eighth International Congress of Entomology to be held in Stockholm, Sweden, August 9 to 15, 1948. Dr. O. A. Johannsen of Cornell University, Ithaca, N. Y., member of the executive committee wishes for all prospective attendants to be acquainted with details involved in arranging for passage to Europe.

"The fact that all steamship sailings are currently booked to capacity for months in advance, makes it necessary for those expecting to attend the congress in 1948 to arrange for passage as early as possible," he says. Although steamship companies have not issued sailing lists for 1948 as yet, this is expected to be done in the fall.

Dr. Johannsen announces also the Thirteenth International Congress of Zoology which is to be held in Paris in July, 1948, and indicates that those desiring to attend either the Stockholm or Paris meeting should inform him by writing him in care of Comstock Hall, Cornell U., Ithaca, N. Y.

Fertilizer from Soviet?

Reports from Miden, Germany late in June indicated that the Soviet Union is to deliver within a five month's period, some 95,000 tons of potash fertilizer material for shipment to Japan and Korea. The price of $34 per ton, according to the report, was regarded by U. S. business observers to be high. The contract was signed by the United States War Department for the sum of $3,250,000 which went to the Soviet zone military government. American army officials in Minden, however, were reported to be satisfied at the price in view of the world-wide shortages.

N.A.I.D.M. in Chicago Convention

THE National Association of Insecticide and Disinfectant Manufacturers held its 33rd mid-year convention at the Edgewater Beach Hotel, Chicago, June 9 to 11. The more than 400 attendants centered their attention on current problems, new insecticidal materials, and discussions concerning future activities. Dr. Alfred Weed, John Powell & Co., Inc., New York, spoke on "Insecticide Scientific Developments," and H. A. U. Monro of the Canadian Department of Agriculture discussed DDT residues. M. H. Doner of J. R. Watkins Co., Winona, Minn. talked on proposed methods of testing residual sprays, and L. W. Kephart, in charge of Weed Investigations of the U.S.D.A., Beltsville, Md., told about the technical and commercial aspects of 2,4-D.

J. A. Jennemann of E. I. duPont de Nemours & Co., Inc., Wilmington, went into detail to discuss the raw material supply in the insecticide field.

S. A. Rohwer, assistant chief of the Bureau of Entomology and Plant Quarantine, U.S.D.A., discussed the future of insecticides, stating that "if properly and effectively handled for what they are," the war surpluses will soon be out of the way, and that the over all situation "leaves plenty of room for honest initiative and competition."

In a thorough discussion on synthetic insecticides, E. F. Knipling of the Bureau of Entomology and Plant Quarantine, U.S.D.A. compared the toxicity of some of the newer materials against various insect pests. He stated that the minimum effective dosage of chlordane is lower than or close to that of DDT, and as a space spray is slightly more effective against houseflies, but less toxic to yellowfever mosquitoes. Numerous experiments have been made in this field, he said.

Chlorinated camphene, he said, is slow in action like DDT, but has been found ineffective against cattle grubs and horse flies. On infested animals, however, it is "perhaps equal or superior to DDT" against the lone star tick and winter horse tick. Compared with DDT, lower concentrations of the material are required to kill lice on cattle.

Among other promising insecticides discussed were the pyrethrum synergists, including piperonyl cyclohexenone, piperonyl butoxide, and N-isobutyl undecylenamide (IN-930) which not only increase the killing effect of pyrethrum but also extend the duration of the insecticide. The methoxy analog of DDT was discussed, as was DDD, both of which were reported to be less toxic to warm blooded animals than DDT. Hexaethyl tetraphosphate was described as being highly toxic to warm-blooded animals.

Arkansas Ass'n Meets

E. Allen Biddle, Blytheville, Ark., was elected president of the Arkansas Pest Control Association at the group's organization meeting at Little Rock, June 1. Other officers named were J. Harvey Hewitt, Pine Bluff, vice-president; and Carl L. Whitson, Little Rock, secretary-treasurer. Members of the board of directors in addition to the officers, are Deltin Mills of Texarkana, and J. C. Black, Earle, Ark. Speakers at the one-day meeting included W. B. Hill of the Hill-Smith Termite Co., Memphis, Tenn.; M. W. Smith, Memphis, entomologist; and H. O. Abel, Dallas, Texas, president of the Texas Pest Control Association and vice-president of the national organization.

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St. Louis Office for Powell

Ralph Morris, formerly eastern seaboard sales representative for John Powell Co., New York, has been placed in charge of the company's new branch office in St. Louis. Mr. Morris, a trained entomologist, will represent the Powell Company in Alabama, Mississippi, Texas and Oklahoma. His headquarters are at 1045 Paul Brown Building, St. Louis. This innovation is for the purpose of giving better service to insecticide manufacturers in the area, and close-at-hand technical information.

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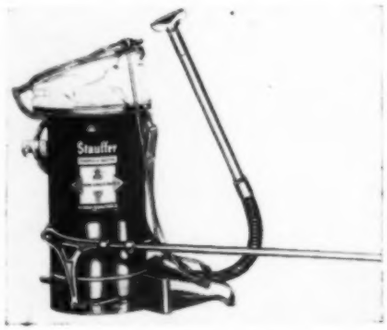
Hudson Offers New Duster



H. D. Hudson Mfg. Co., Chicago, has announced a new "Stauffer knapsack duster" for use in orchards, vineyards, fields, nurseries and farms. One feature of the duster is a "blast" or "puff" control provided by the discharge feed lever. It can be set to provide a large uniform blast for covering entire plants, or for small discharges to place the dust in the heart of the plant. The bellows are made of a new material which is described as being flexible, tough, and mildew-resistant. An extra large tank has capacity for 20 pounds of dust to reduce frequency of filling. Further information is available from the company, 589 E. Illinois St., Chicago 11.

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New Calif. Ass'n. Members

The California Fertilizer Association has announced the names of new active and associate members of the organization. New members are listed as Chemical Fertilizer Co., Modesto, California and Chemurgic Corporation, Richmond, Calif. New Associate members are American Gypsum Co., Fresno, Calif., and Herrgott & Wilson, San Francisco.

New Staff Members Named

New York Botanical Garden has announced the appointment of three new staff members, effective on the first of July, August, and September. Dr. P. P. Pirone joined the staff on July 1 as Plant Pathologist; Dr. Richard A. Howard will join as Assistant Curator August 1; and Dr. Donald P. Rogers will begin his duties as Curator in the Cryptogamic Herbarium, September 1.

Dr. Pirone for the past 10 years has been associate professor of Plant Pathology at Rutgers University, New Brunswick, N. J. He is a graduate of Cornell University, and after receiving his Ph.D., returned to the school as extension Assistant Professor of Plant Pathology, being placed in charge of research on diseases of ornamental plants two years later. Ten years ago he joined the staff of Rutgers. Dr. Pirone is the author of numerous technical papers and popular articles, and has collaborated with other authors in the preparation of works on various plant diseases. In his new position he has charge of disease and pest control on ornamental plantings, in addition to continuing research on diseases of ornamentals. Dr. B. O. Dodge who retired January 1, and whose place Dr. Pirone is filling, retains his office at the Garden to continue his investigations on *Neurospora* and other plant diseases.

Dr. Howard, new assistant curator as of August 1, comes directly from Harvard University where he has been teaching since his discharge from the armed forces early in 1946. He is a graduate of Miami University, Oxford, Ohio, and received his later degrees from Harvard.

Dr. Rogers who expects to join the Botanical Garden staff on September 1, is now at the University of Hawaii. He is a graduate of Oberlin College, and received his Ph.D. from the University of Iowa.

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Joins Fertilizer Sales Staff

Richard Goldthwaite has joined the sales force of the Chemical Division of Lion Oil Company, El Dorado, Arkansas, manufacturers of ammonia and ammonium nitrate fertilizers. Mr. Goldthwaite for the past 11 years was sales representative for the Barrett Division of Allied Chemical & Dye Corp., and before that was a sales representative in Alabama for American Agricultural Chemical Co. He is a native of Alabama and a graduate of the University of Alabama.

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Pyrethrum Extract Offered

John Powell & Co., Inc., New York has announced production of a new basic pyrethrum extract, designated as "Powco brand Pyrethrum Extract #20." The extract was developed through a specialized process which the company states allows the product to retain stability, freedom from sedimentation, and certain other characteristics. The material is said to be low in Freon insulubles, making it particularly adaptable for use in the manufacture of aerosol bombs.

Pest Control Ass'n to Meet

The National Pest Control Association has announced its fifteenth annual convention to be held at the Bellevue-Stratford Hotel, Philadelphia, October 27, 28 and 29. Program details will be announced at a later date. •

Fisher Resigns at S-W

Wayne B. Fisher, formerly of the Insecticide Sales Department of Sherwin-Williams Co., has announced his resignation from S-W as of June 21. Mr. Fisher has been with the firm for nine years. Mr. Fisher is co-author with Dr. J. A. McClintock of Purdue U., of the book, "Spray Chemicals and Application Equipment." Mr. Fisher has not announced his future plans. •

Poison Ivy Control Program

National Farm Safety week is to be observed July 20-26, sponsored by the National Safety Council. The National Sprayer and Duster Association has sponsored a poison ivy elimination program in connection with the week's observances, and has issued a pamphlet describing the use of 2,4-D and other toxic materials in poison ivy control. The leaflet is being distributed in farm communities throughout the nation by the National Safety Council. •

Monsanto Advances Two

Monsanto Chemical Co., St. Louis, has announced that Dr. R. M. Hitchens is now research director of the company's organic chemicals division. He succeeds Dr. Lucas P. Kyrides, recently resigned. It is also announced that Dr. O. J. Weinkauff is advanced from assistant director to associate director, the place formerly held by Dr. Hitchens.

HERBICIDES

(*Continued from Page 19*)

Group 6; The Water Sterilants

EMULSIONS of trichlorophenol have been successfully used in irrigation and drainage ditches, particularly for the control of submerged aquatics. Other organic compounds are promising for this type of weed control. Perennial submerged aquatics are not killed, but current top growth is destroyed. Toxicity to water is temporary; however, fish are often killed. The use of such materials is necessarily limited to ditches that do not drain into valuable fishing grounds such as those used for carrying irrigation water. Copper sulfate, often used for the control of algae in ponds and resevoirs, has little effect on higher plant forms at ordinary concentrations.

GUEST EDITORIAL

(*Continued from Page 16*)

tained as much or more organic matter, 50 times as much available phosphorus, and several times as much available potash, calcium and magnesium as the virgin or original soil. Good management produced larger crops and improved soils.

In North Carolina about 75 percent of the coastal plain soils that farmers sent to the state soil testing laboratory in a recent year were high in available phosphate. This is the result of the use of fertilizers, one important element in soil management and improvement.

Similar examples could be drawn from other States in the older fertilizer consuming regions. We recognize, of course, that many soils of these same regions were not properly managed. Only in recent years have we undertaken the improvement of the extensive acreage devoted to pastures and other forage crops. In some important sections of these regions, soil improvement has made relatively little progress. In many places erosion has been serious. Land that should have been in timber or permanent pasture has been cultivated. Other mistakes have been made. The fact remains, however, that millions of acres have been well managed. They are very productive. The use of fertilizers and lime has helped raise their fertility level, and real soil improvement has been achieved on an extensive scale.

I have considered the older fertilizer consuming regions because they show what can be accomplished and that there are opportunities for further progress. A somewhat different situation prevails in certain other regions.

The great production of crops in the Midwest has been based primarily on the high native fertility of the prairie soils. Unlike the soils of the East and South, they were high in organic matter, nitrogen, phosphate, potash and lime. These fertile soils have been exploited. Even when well managed, comparatively speaking, the level of fertility has declined. For

example, it has been repeatedly shown that the organic matter content of the soil on typical farms has been reduced 25 to 40 percent as compared to the virgin, uncultivated soil.

The degree of exploitation can be illustrated by considering a few figures for Iowa. The harvested crops in Iowa contain about 175,000 tons of phosphoric acid (P_2O_5). Possibly one-third of this is returned in farm manures. The net removal is more than 100,000 tons. To offset this, Iowa farmers applied 23,240 tons P_2O_5 in 1945, only 13 percent of the total removed by crops.

The loss of nutrients in the Midwest is further illustrated by their movement in commercial feeds. In a recent year, 1942, New England bought, in the form of livestock feed, 48,000 tons nitrogen, 31,700 tons phosphoric acid and 17,700 tons potash. The same year fertilizers supplied New England 18,279 tons nitrogen, 48,934 tons phosphoric acid, and 40,500 tons potash, Feeds brought in from other areas carry almost as much plant food as do the commercial fertilizers used in New England. What is the source of this plant food? Not the phosphate mines of Florida or the potash mines of the West. It comes from the fertile soils of our grain belt.

A few years ago, most of the farmers of the Middle West had little use for commercial fertilizer. However, their experience in increasing production during the war years and their participation in the conservation programs has taught them the important part chemical fertilizers can play in efficient crop production and soil improvement.

The exploitation of the fertility of our better soils must not continue. Even the best soils can be worn out, their fertility and productivity reduced. Farmers of the Midwest could well adopt some of the soil management practices followed by good farmers of the East and South. One of these is the liberal use of fertilizers. This will supplement and increase the effectiveness of other good practices. This is true not only of the Midwest but of other areas too. Every region and every State has an opportunity to improve its soil through further use of fertilizers for this purpose. This is not theory. Fertilizers have demonstrated their value for soil improvement.

Several things follow logically if we accept this conclusion of the place of fertilizers in soil improvement and make the most of the opportunity presented.

First, there is need for further research directed to the improvement of fertilizer recommendations for the individual farmer.

Second, additional fertilizer production facilities must be provided to meet the unfilled demand for plant nutrients.

Third, full advantage should be taken of all technological advances in fertilizer production. This would result in the increased production of high-analysis fertilizer materials and high-grade mixed fertilizers.

Fourth, fertilizer prices should reflect the benefits of efficient production and distribution methods.

Fifth, the industry and government should cooperate in programs of research and education to promote the efficient use of fertilizers and lime in soil improvement.★★

N. F. A. MEETING

(*Continued from Page 33*)

tried. These tend to insure a constant flow of the liquid, important because a uniform application is desirable. He told of specialized machines now under development, for applying liquid fertilizer equipment at desired depths in the soil. One type of machine applies anhydrous ammonia. "These machines are provided with metering devices and soil furrowing tools with suitable provisions for readily closing the furrows to minimize vapor losses," it was stated.

The use of airplane broadcasting of fertilizer materials is also an actuality. This equipment is no longer confined only to flooded rice fields, but has been used to top-dress other crops . . . particularly with nitrogen materials, Mr. Cumings said.

A paper prepared by Prof. C. J. Chapman, soils specialist, University of Wisconsin was presented by R. H. Lush of the NFA due to Mr. Chapman's illness. In the paper, Mr. Chapman related some of his experiences educating Wisconsin agriculturalists in the use of fertilizer materials. He reported that the state has increased its use of fertilizer over a hundred fold since 1916, and credits much of this development to education, test programs and the need for

better yields. The steps being taken in Wisconsin are typical of the general trend in the midwest, the paper stated. "The opportunities for increased income and better living through the more generous and liberal use of lime and fertilizers in Wisconsin and other mid-western states is just now unfolding itself to our farmers . . . who have just begun to appreciate the importance of fertilizers in a program of low cost crop production."

Chairman of the N.F.A. Board of Directors, Weller Noble of Pacific Guano Co., Berkeley, Calif., made his annual report to the convention. He reviewed the history of the association, naming the milestones of progress in the publication of literature, conducting numerous surveys, and cooperating in research which has helped the industry to advance. He reviewed the work of the association during the war years, pointing out the function of the group in offering counsel and information during those hectic years.

At the annual banquet held Friday evening, the group heard Harold M. Fleming, special writer for the Christian Science Monitor, speak on economics. He presented statistics and historical data to indicate a continuation of "good times," and doubted the likelihood of another depression occuring in the near future.

The association re-elected its officers at the meeting. M. H. Lockwood remains as president, and Weller Noble continues as chairman of the board. R. L. King, Georgia Fertilizer Co., Valdosta, Ga., was re-elected vice-chairman, and Daniel S. Murph, Washington, D. C., was re-named secretary-treasurer of the association. New directors were elected as follows: Directors-at-Large are Lester E. Britton, Consolidated Rendering Co., Boston, Mass.; J. A. Chucka, Eastern States Farmers' Exchange, W. Springfield, Mass.; Robert S. Cope, Reliance Fertilizer Co., Savannah, Ga.; Leon H. Davis, Southern Cotton Oil Co., New Orleans, La.; J. H. Owens, Roanoke Guano Co., Roanoke, Ala., and M. S. Hodgson, Empire State Chemical Co., Athens, Ga.

District directors named were: W. H. Gordon, Chamberlin & Barclay, Inc., Cranbury, N. J.; E. N. Carvel, Valliant Fertilizer Co., Laurel, Del.; R. L. Kings, Georgia Fertilizer Co., Valdosta, Ga.; H. B. Fultz, Hector Supply Co., Miami, Fla.; H. A. Parker, Sylacauga Fertilizer Co., Sylacauga, Ala.; C. D. Shallenberger, Shreveport Fertilizer Works, Shreveport, La.; S. F. Elwood, The Farmers' Fertilizer Co., Columbus, Ohio; E. B. Helgeson, Magnolia Fertilizer Co., Seattle, Wash.; H. A. Thullbery, Haines City Fertilizer Co., Haines City, Fla.; M. G. Field, Meridian Fertilizer Factory, Hattiesburg, Miss., J. L. Nichols, Sumpter Fertilizer Mfg. Co., Sumpter, S. C., and A. A. Schultz, Reading Bone Fertilizer Co., Reading, Pa.

A. P. F. C. MEETS

(*Continued from Page* 29)

We have spent hundreds of millions teaching farmers how to produce and we have spent other hundreds of

millions teaching them how to control production, but we have spent only a nominal sum teaching them the arts of distribution and marketing," he said.

In referring to world trade, Mr. Cooley termed it a "two-way road" and stated that "world trade must be revived and revitalized, and the wheels of world commerce must start turning at not some distant date, but immediately." He warned against cut-throat competition, and stated that a prosperous agriculture is essential to the nation's prosperity and well-being. The world demand for fertilizer materials at the present time is unlimited, he observed "While I am anxious for every possible effort to be made to meet these fertilizer demands, I am frankly of the opinion that the fertilizer industry has done a splendid job and if given the opportunity, will make further strides in meeting both domestic and foreign demands."

The annual banquet the evening of June 14 was preceded by a cocktail party at which the entire convention party were the guests of the Potash Company of America Judge Woodrum acted as toastmaster at the banquet, and also surprised many of the group by displaying a well trained voice in two vocal selections. Bob Kennedy, star of "Oklahoma" also sang several selections. Following the address of Hon. Clinton P. Anderson, the full text of which appears elsewhere in this issue, another unscheduled speaker, "Whiskers" Fitzgerald was introduced by Judge Woodrum. Described as an eminent Russian visitor to the United States, Comrade Fitzgerald further cemented Russo-American amity by a friendly talk in which the shortcomings of the American system and the virtues of the Soviet Union were emphasized. The Fitzgerald whiskers of course eventually proved to be false, and the talk just a comedy interlude, much to the amusement of the audience.★★

Resolution

adopted by the American Plant Food Council in its business meeting on the morning of June 14:

WHEREAS, the fertilizer industry recognizes that an adequate agricultural research and educational program is essential in a well-balanced and coordinated farm program, and,

WHEREAS, adequate financial support of the research and educational agencies of the Federal and State Departments of Agriculture and the Land-Grant Colleges is essential in fostering a sound program of land management and conservation, and,

WHEREAS, the fertilizer industry has always strongly supported sound research and educational programs in the past and is contributing to scientific progress in its own research and educational programs

THEREFORE BE IT RESOLVED that the Board of Directors of the American Plant Food Council in annual session at Hot Springs, Virginia, unanimously endorses the broad objectives of the research and educational programs now being conducted by the Federal and State Departments of Agriculture and the Land-Grant Colleges and hereby urges that adequate financial support be provided to assure a continuation of the programs so essential to the economic well-being of American agriculture.

CROP ABUNDANCE

(*Continued from Page 35*)

has ever had such an opportunity. Perhaps no country will ever have the opportunity if the U. S. fails to lead the way while there is opportunity.

At the moment, the chances do not look too bright. The entire farm program is endangered by the recent action of the House of Representatives. The Department of Agriculture Appropriation Bill that was passed by the House would cut the Agricultural Conservation Program by about one-half this year and kill it completely next year. It would knock out the farmer-committee system for democratic formulation and administration of conservation, price support and other programs. It would cut the work of the Soil Conservation Service. It would seriously interfere with the established government policy for extending credit to veterans and small farmers. It would stop a number of important research projects, including some on soils and fertilizers that are important to industry as well as to the farmers.

As disturbing as the actual mutilation of programs is the philosophy of the committee which recommended the action. It frankly does not like action programs. It wants to head backward to the days when farmers had no national programs for joint action and mutual protection.

If this represented the views of many people, it would mean no particular policy could be followed at all—to say nothing of a pioneering policy of organized, sustained, realistic abundance.

However, there is confidence that the great majority of the United States people have a different and broader view. The people have responded to the challenge of hunger in the world. They will also respond to the challenge of plenty.★★

CORN BORER

(*Continued from Page 24*)

ious parts of corn plants treated with DDT show rather conclusively that there is little or no danger of DDT residues contaminating the kernels which are completely covered by the shucks. Furthermore, the ears are not likely to become contaminated in the process of handling, marketing, or canning. Residues do remain, however, for considerable periods of time on the leaves, outer husks, and main stalks of the plant. The residues on leaves and other parts of the plant diminish with age and are reduced normally to a comparatively low level by the time the crop is ready for harvest. Farm animals allowed to graze in treated fields after harvest have suffered no ill effects. However, it is known that dairy animals, without showing or suffering ill effects, may eliminate some of the DDT consumed by way of the milk which they produce. Whether the contamination of milk in this manner would involve a local health hazard remains to be determined. In the meanwhile, however, it would be definitely unwise to permit dairy animals to graze on contaminated crop residues.★★

Industry Patents

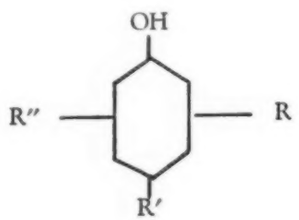
The following patents have recently been issued by the U.S. Patent Office on products and devices in the agricultural chemical field. Copies of the patents may be obtained at 25c each by addressing the U.S. Patent Office, Washington 25, D.C.

2,420,801. PROCESS FOR PRODUCTION OF HEXACHLORETHANE. Patent issued May 20, to George B. Stratton, Niagara Falls, N. Y., assignor to Hooker Electrochemical Co., Niagara Falls, N. Y. The process for production of hexachlorethane which comprises charging tetrachlorethylene into a vented pressure-type reactor to somewhat less than the full capacity thereof; displacing the air from above the liquid by means of a gas inert to the reaction; passing gaseous chlorine into the liquid under light of a quality effective in catalyzing the reaction, at a rate at which the chlorine is substantially all absorbed, with cooling to maintain the reaction mixture at 100° to 110° C. and venting off of excessive pressure due to expansion of the liquid or chlorination of impurities, without however permitting any considerable vaporization of the reaction mixture, until one fourth to one half of the theoretical quantity of chlorine for completion of the reaction has been admitted; thereupon regulating the cooling and further admission of chlorine to permit the temperature to rise with the progress of the reaction, and thus prevent formation of crystalline hexachlorethane in the reaction mixture, until the temperature has risen as far as practicable from the heat of reaction; thereupon supplying external heat and regulating the further admission of chlorine to cause the temperature to rise to between 190° and 220° C. and pressure to build up in the closed reactor, at least to the corresponding vapor pressure; and so carrying the reaction to substantial completion in liquid phase.

2,420,809. ACTIVATORS FOR TERPENE THIOCYANOACYLATE INSECTICIDES. Patent issued May 20 to Joseph N. Borglin, Wilmington, Del., assignor to Hercules Powder Co., Wilmington. An insecticide composition comprising pyrethrum, a terpene thiocyanoacetate, and para-tertiary butyl catechol.

2,420,928. DIALKOXYARYL TRICHLOROMETHYL METHANE COMPOUNDS AS INSECTICIDES. Patent issued May 20 to Euclid W. Bosquet, Wilmington, and Avery H. Goddin, Newark, Del., assignors to E. I. duPont de Nemours & Co., Wilmington. A fly spray composition consisting essentially in a fly spray base hydrocarbon solvent containing a toxic amount of di(paramethoxyphenyl)-trichloromethyl methane.

2,421,223. STABILIZED INSECTICIDE. Patent issued May 27, 1947, to Harschel G. Smith, Wallingford, and Mark L. Hill, Yeadon, Pa., assignors to Gulf Oil Corp., Pittsburgh, Pa. A stable pyrethrin-containing insecticide, stabilized against deterioration by light, the improved insecticide compositions comprising a pyrethrum extract in a hydrocarbon solvent containing a minor amount of 2,4,6 trialkylated monohydroxy phenol having the following formula:



wherein R and R′ represent tertiary butyl groups and R″ represents an alkyl group selected from the class consisting of methyl and tertiary butyl groups, the amount of said tryalkylated phenol bring sufficient to stabilize the pyrethrin-containing insecticide against deterioration by light and air and to inhibit loss of insect killing efficiency when exposed to light and air.

2,421,569. INSECTICIDE. Patent issued June 3, to Frederick B. La Forge, Arlington, Va., and William F. Barthel, College Park, Md., assignors to the United States of America, as represented by the Secretary of Agriculture. An insecticidal composition comprising pyrethrum and 3,4-methylenedioxybenzyl n-propyl ether as a synergist therefor.

2,421,570. INSECTICIDE. Patent granted June 3 to Frederick B. La Forge, Arlington, Va., assignor to the United States of America, as represented by the Secretary of Agriculture. An insecticidal composition comprising pyrethrum and alpha-(3,4-methylenedioxyphenyl)-tetrahydropyran as a synergist therefor.

Trade Mark Applications

HEXCO, hand-lettered capital letters in an oval shield, with letter "X" in background between letters "E" and "C" in the word. For insecticides. Filed Apr. 30, 1946, by Heckethorn Mfg. & Supply Co., Littleton, Colo. Claims use since on or about Mar. 2, 1946.

BERCO, in ornate capital letters, white on black, within a circular design featuring geometric patterns resembling the 16 points of the compass. For insecticides and fungicides. Filed June 8, 1946, by J. Berlage Co., Inc., New York. Claims use since December, 1945.

VITOX, in capital letters, with an oversized "T," and entire word enclosed in oval, for insecticides and insect repellent. Filed Nov. 30, 1945, by Silby Chemical Co., Inc., Miami Fla. Claims use since Aug. 26, 1944 on insecticide; and since about Aug. 26, 1944, on insect repellent.

MOTALIZER, in capital letters, for soil vitalizer, containing motes and chemicals. Filed Aug. 3, 1946, by Lucille Thomson Olive, Charlotte, N. C. Claims use since July 13, 1946.

Trade Marks Granted

429,336—WEED KILLER. Filed April 20, 1946, by U. S. Rubber Co., New York.

429,362—CHEMICAL PREPARATION FOR REPELLING ANIMALS AND INSECTS. Filed May 8, 1946, by E. L. Eckerley, Hamilton, Ind.

429,406—PARASITICIDES. Filed May 31, 1946, by General Chemical Co., New York.

Classified Advertising

Rates for classified advertisements are ten cents per word, $2.00 minimum, except those of individuals seeking employment, where the rate is five cents per word, $1.00 minimum. Address all replies to Classified Advertisements with Box Number, care of AGRICULTURAL CHEMICALS, 254 W. 31st St., New York 1. Closing date: 1st of month.

Entomologist: 28 yrs. has M.S. degree in economic entomology and interested in research position. Now regularly employed. Address Box 166, care of *Agricultural Chemicals.*

For Sale: Paris Green. One carload in 100 pound drums, 20¢ pound. Chemical Service Corporation, 80 Beaver St., New York 5.

Grasshoper Invasion Halted

Preliminary reports from El Salvador indicate that the recent emergency shipments of benzene hexachloride to that country to control an invasion of grasshoppers, have been successful. Although details were lacking late in June, indications were that satisfactory control of the pest had been achieved.

Cooperating in getting the toxic material and application equipment to El Salvador, were John Powell & Co., Inc., New York, and H. D. Hudson Co., Chicago. Some 50,000 pounds of benzene hexachloride were rushed to Central America by chartered planes, and at the same time the application machinery was also dispatched to the scene. It arrived in time to check the infestation and save the major portion of the country's coffee crop.

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Colloidal DDT Manufactured

Michigan Chemical Corporation of St. Louis, Mich. has announced the manufacture of a new type of DDT formulation known as "Pestmaster." The product carries extremely fine, colloidal size solid particles of DDT in a water base. Pilot plant quantities are now being made, according to the company, and plans are under way for expansion to full scale manufacture of the product. "Pestmaster Colloidal Dispersion" is a 40% DDT concentrate developed in the company's laboratories. The colloidal DDT particles are about a third the size of those in micron size wettable powders, and about one 25th the size of DDT particles produced by usual grinding methods, the company states. These fine particles remain in suspension longer and may be used at strengths as high as 5% or more without clogging spray nozzles, according to the manufacturers.

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J. S. Houser Dies

John S. Houser, 66, chief entomologist at the Ohio State Agricultural Experiment Station, Wooster, Ohio, died June 26 at Wooster as the result of a heart attack. Mr. Houser had been connected with the Ohio station for many years, being chief entomologist since 1926. He was graduated from Kansas State College in 1904, and received his Master's degree from Cornell University in 1911. He was an authority on field, foresty and shade-tree entomology, and was a pioneer in the use of airplanes to control forest insects.

Advertisers' Index

(The Advertisers' Index has been carefully checked but no responsibility can be assumed for any omission.)

TALE ENDS

"Operation Ragweed" began its second year of activity in New York City's five boroughs June 17. The campaign calls for the application of 2,4-D to some 8,000 acres of weed-infested vacant lots in the area to kill unwanted plant growth, particularly ragweed. Inspector Philip Gorlin, of the New York Bureau of Sanitation, in charge of the project, reports that although a lack of funds and new equipment hampers the operation, from 15 to 20 units are in use daily. The speed is roughly 2½ acres per unit per day. Last year's campaign used some 3,000 pounds of 2,4-D, and the program of 1947 is expected to duplicate or surpass this figure. Low concentrations are used because of the type of equipment and untrained personnel. Mr. Gorlin described the concentration as being from 1¼ to 2½ lbs. per acre, and the amount of water running from 200 to 300 gallons per acre. A sidelight on the program is the fact that a complete survey of the city has been made, and a map prepared showing every known plot where ragweed exists.

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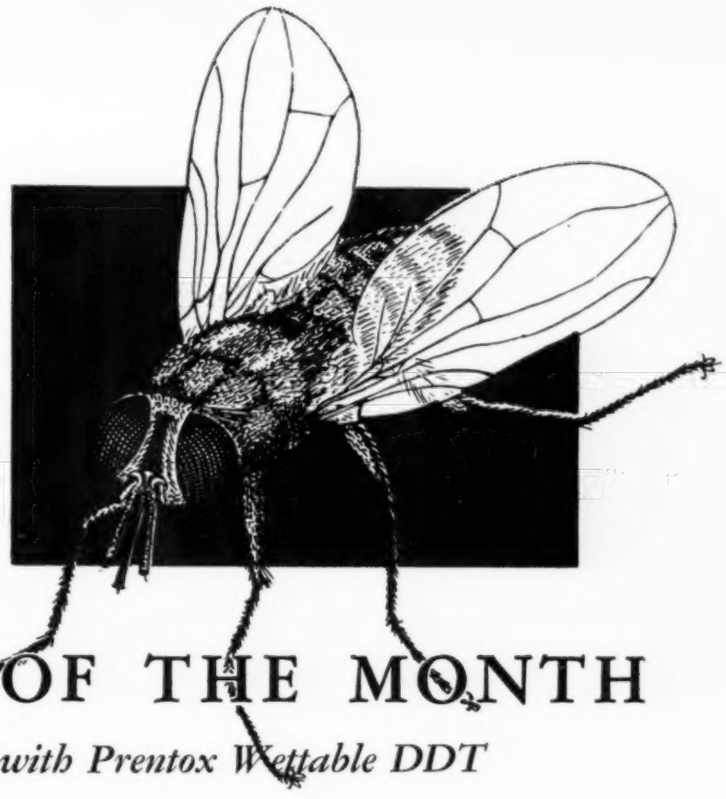
Legal Note: Killing mosquitoes or caterpillars on Sunday is not a violation of the Sabbath law . . . at least not in New York. Alex Nesteruck, of Long Island, tree surgeon was spraying a tree on a recent Sunday morning, when a patrolman gave him a ticket. In court, the defendent argued that insects don't go by the calendar, and that in a wet season one must take advantage of every dry day possible to control various pests. Magistrate Henry A. Soffer agreed, saying that "the war against insect pests must be carried on at every opportunity. The Sabbath Law was not designed to thwart it. It would be terrible to awaken on a Sunday morning and be afraid to swat a mosquito or destroy a caterpillar for fear a policeman might come along and write a summons. The charge is dismissed."

HORN FLY

(*Haematobia irritans* Linne)



BUG OF THE MONTH

...controlled with Prentox Wettable DDT

FROM early April until the sharp frosts of October, swarms of horn flies hover over cattle whenever they are out of doors. Similar to the stable fly, but only half as large, these blood-sucking pests cause such pain and annoyance that they interfere with both feeding and resting.

The cattle lose weight, yield less milk, develop indigestion, and suffer other disorders. Further, the horn fly is suspected as a carrier of anthrax which, once established in a herd, can result in even more serious economic loss.

Yet this scourge of pasture, range and feed-lot can be controlled, at low cost, with sprays formulated from Prentox DDT Concentrates. Prentox Micro-Mesh Wettable—or for special applications Prentox 25% Water-Miscible DDT—are ideal for this purpose.

We suggest that you put major emphasis, in your 1947 livestock spray program, on the attractive new idea of "fly-proofed" cattle. Extra cash returns to the rancher, dairyman and feed-lot operator—in terms of more beef and milk per animal—will far outweigh the cost of spray required.

Your inquiries are invited. Our specialized knowledge of insecticides is always at your disposal—for the development of consistently better insecticides.

R. J. PRENTISS & CO., Inc.

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QUANTITY PRODUCTION OF BENZENE HEXACHLORIDE

STARTED LAST FEBRUARY

for Carload Deliveries NOW!

Westvaco assures you of a *dependable source* of Benzene Hexachloride and its dust concentrate formulations in any quantity, whenever and wherever needed.

Dependable—because Westvaco is one of America's largest and oldest producers of Chlorine and Chlorinated Products with controlled production from basic raw materials to finished products.

Insecticide Manufacturers and Compounders are invited to address our Agricultural Chemicals Division for samples, prices and delivery schedules.

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